DOCUMENT RESUME

ED 071 917 SE 015 556

AUTHOR	Roller, Lib
TITLE	Using the School and Community, An Environmental Study Area, Teachers' Handbook.
INSTITUTION	Nashville - Davidson County Metropolitan Public Schools, Tenn.
PUB DATE	72
NOTE	194p.
EDRS PRICE	MF-$0.65 HC-$6.58
DESCRIPTORS	Community Study; *Elementary Grades; *Environmental Education; *Instructional Materials; Interdisciplinary Approach; *Learning Activities; Outdoor Education; *Teaching Guides; Trails

ABSTRACT

Designed to give the elementary teacher some ideas for using the school site and the community as an environmental study area, this guide offers activities and suggestions to explore all aspects of the environment. Gaining an understanding of the environment and man's relationship to the environment are emphasized. The ultimate goal is to develop citizens with a personal sense of involvement and an attitude that will guide their behavior towards the wise use of all our resources. Part 1 discusses selecting a site for environmental study and surveying its educational possibilities. Part 2 outlines steps for getting up a nature trail on school grounds together with activities for use of the trail. The interdisciplinary approach of environmental education is promoted in Part 3. Work sheets for on-site involvement in language arts, social studies, science, math, art and music are given. Several pages and ideas adapted from "All Around You, An Environmental Study Guide" (ED 064 131) are reprinted. Part 4 deals with environmental problems: air, water, noise, waste, and visual pollution, land use, population, and miscellaneous urban problems. Each topic provides background material for the teacher, activities for the classroom, and school site and community activities. (BL)

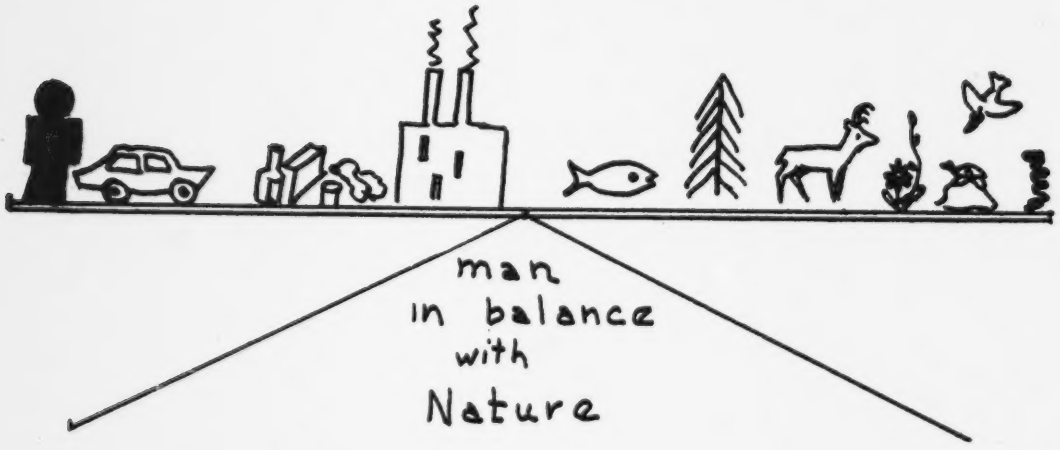
ED 071917

TEACHERS' HANDBOOK

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

USING THE SCHOOL AND COMMUNITY

AN ENVIRONMENTAL STUDY AREA



NASHVILLE METRO SCHOOLS
ENVIRONMENTAL EDUCATION DEPT
LIB ROLLER COORDINATOR

SE 015 556

ED 071917

BOARD OF EDUCATION

C. R. Dorrier, Chairman

Frank P. Grisham, Vice Chairman

L. C. Biggs

Isaiah T. Creswell

Mrs. Irwin B. Eskind

Walden S. Fabry

W. J. Harbison

Mrs. C. F. Mager

INTRODUCTION

Today it is becoming increasingly more evident that education must concern itself, not only with learnings in the classroom, but with an awareness of the environment and man's relationship to it.

We must relate to the total world, not only the natural environment but our total cultural environment, both past and present. By understanding man's use and misuse of the natural community we can better deal with the problems that now face us. Each student, through understanding and appreciation, can become a responsible citizen who will do his share in shaping a better world in which to live.

True learning can only be realized by using all facets of education, but in Environmental Education involvement is the "name of the game". Discussions, reading, audio visual presentations, local resource speakers, all are important. Children are never too young to learn more about their environment and the social awareness of themselves and their community. The following activities and suggestions are planned to explore all aspects of the environment. Suggestions for involvement in language arts, social studies, math and the fine arts are included, as Environmental Education must be taught in an interdisciplinary approach. Environmental Education is not a single subject but rather a synthesis of all understandings and skills. By using the school site and the community, either urban or rural, a teacher can better communicate to the students the interdependence and relationships that exist in nature. The concepts thus learned in an involved activity can be applied to a subject area and bring the student closer to an understanding of the environment and man's relationship to it. The ultimate goal for this method of teaching is future citizens with a personal sense of involvement and an attitude that will guide their behavior towards the wise use of all of our resources.

In order that the school site and community be used as an environmental study area, learning activities must be established. Each lesson should introduce a problem, allow for creative thinking and student-involved activities. Lessons should not be concerned entirely with problems; no matter where you may have a study area, there will be some beauty and examples of the miracle of nature. No matter what the age of the student might be, each can explore and discover for himself a simple problem and answer. Many adverse problems will lend themselves to a number of solutions and some will remain open-ended with no "right" answer. All of the lessons should be used with the idea that this is merely part of what could be done, leaving open the road for futher study by the class or by an individual student. On-site activities should lead the student to continue their investigations back in the classroom.

This handbook is designed to give the teacher a few ideas for using the school site and the community as an environmental study area. Each site will be different and only the classroom teacher can adapt and develop lessons that will fit their area and their class.

There are many good references now being published. A list of suggested books, pamplets and other materials, both for teacher and student, are included with each section of the handbook.

The schools must develop and implement programs of Environmental Education to ensure that our young people understand the complex issues, scientific, political, technological, economic and legal, which contribute to environmental pollution. The real problems of today must be included in all studies throughout school grades and taught where they happen -- in the out-of-doors.

TABLE OF CONTENTS

I Selecting a Site for Environmental Study and Surveying its Educational Possibilities

II Building a Nature Trail
1. Setting up stations
2. Labels and signs
3. Self guiding trails or student guides
4. Problems on a trail--vandals, changes in seasons
5. Identifying-pro and con
6. Games and quizzes on a trail
7. Using the trail as enrichment for all of the curriculum (by grade levels)
A. Language Arts
B. Social Studies
C. Science
D. Math
E. Art and Music
8. Bibliography, sample trail signs and guide booklets, sample tags

III Using the School Site and Community Without a Formal Trail
1. Sample work sheets for student-involved activities on site (by grade levels)
A. Science
B. Social Studies
C. Language Arts
D. Math
E. Art and Music
2. Vacant lot studies
3. Bibliography books, magazines and other resources

IV Environmental Problems
1. Air Pollution
A. Background material for the teacher
B. Activities for the classroom
C. Activities for the school site
2. Water Pollution
A. Background material for the teacher
B. Activities for the classroom
C. Activities for school site or community
3. Land Use
A. Background material for the teacher
B. Classroom activities
C. School site and community activities
1. Urban Archeology
4. Noise Pollution
A. Background material for the teacher
B. Classroom activities
C. School site and community activities
5. Waste Pollution
A. Background material for the teacher
B. Classroom activities
C. School site and community activities
6. Special Problems

A. Rat Control
   1. Ecology of a city
   2. Problems relating to clean up
   3. Keeping rats under control
B. Odors from factories etc.
C. Vacant houses -- junk
D. Hazards, no sidewalks, traffic problems, dumps

7. Population Problems
   A. Background material for the teacher
   B. Classroom activities
8. Visual Pollution
   A. Classroom activities
   B. School site and community activities

V References and Bibliography

OBJECTIVES

1. The students will acquire the use of the power of observation and curiosity as an avenue of learning.

2. The students will, by involved experiences, feel themselves a real part of their environment.

3. The students will develop a desire and will to protect living and non-living resources and to use them wisely.

4. The students will develop a sense of responsible citizenship about their environment.

5. The students will acquire skills and tools necessary for inquiry and investigation.

6. The students will conduct activities associating learning and living which will therefore help the students to better achieve academic success.

7. The students will learn the problems and possible solutions of the school community and therefore relate more to their school environment.

8. The students will acquire a stewardship of the natural world about them through understanding and knowledge.

9. The students will acquire this knowledge through learning activities in the real life environment.

10. The students will strengthen the use of the senses through close and accurate observations in their inquiry.

SECTION I

Selecting a Site for Environmental Education

In order that the environmental education learnings have relevant meanings to the students the learning areas should be related to the child's own knowledge and background. The area should have specific educational possibilities that can be woven into the regular school curriculum on all grade levels.

The best spot to start is, of course, the school site. No matter how barren or unexciting a site might appear at first there is always a great deal that can be taught on the school grounds. The very cracks of the sidewalk will show many examples of adaptation and survival. The first step in planning a study area is to survey the school site and the area surrounding it. Some schools are fortunate in having more acreage than is needed for school activities. Others may have a small wooded area or a stream with which to work. Those in the inner city, however, will have to use what can be found on the site and then look to vacant lots and parks for more advanced learnings. The usual school site, however, usually contains many types of man made materials. These can show the changes man has made in a natural community. Trees and bushes of any types can be used to show similarities and differences in plants and habitats of animals. Every school site will contain many types of habitats and through these many of the basic ideas of ecology can be taught. The school site can be improved, through plantings and cleanings. Many of the problems that we face today in the environment can be seen, in a minature way, on many school sites. Differences in temperature, so much a factor in both ecology and in pollution, can be studied in the many micro-climates to be found outside the classroom. The study of the building, itself, can show how man has taken natural resources and changed them to fit the new way of life. The numbers of workers represented in the materials and labor can be an extended lesson by itself.

Careful planning must be done in order that the students understand the concepts in both basic ecology, the out of doors and the problems caused by man's use of the environment.

The first step is the school site use. After it has been explored as a micro-community, then the surrounding area, vacant lot, park or whatever is available can be surveyed and used. As students begin to see the environmental problems on a larger scale, an effort can be made to go on field trips, to Nature centers for ecology and the natural community, and to areas within the city that either are a cause for problems or that are helping to solve a particular problem.

If these learnings are started in the early years of school, the knowledge can be built so by the time a student enters high school he will have the understanding and learning that can equip him for an active participation in environmental solutions.

In education today, we are not only preparing a child for future life but we are helping him in what is his life now. Certainly the problems of the environment as well as the understanding of its complex nature cannot wait for him to grow up. Each person, no matter what his age, must join now to create a better world. The school site, and the school community takes up a great deal of a child's life, and for those who come into the school community from another area, this can become a comparison and an awareness of not only different natural areas but of different ways of life.

Whatever subject matter is used, each can show the constructive and destructive relationships of man to the environment. By relating these lessons to the students previous

knowledge, the environmental studies can become a motivating experience.

The lessons out of doors can be as short as ten minutes, or a series of activities that will help develop a special concept. Many ideas and lessons will come from the students and as they develop ideas and activities new avenues of learning will be opened. Every environmental activity should be built on an awareness and appreciation of the environment, whatever it might be, and the dangers threatening it. The understanding and awareness can only come through all subjects in the curriculum.

By surveying the site and the surrounding areas, you, as a teacher, can better know how best to plan a program that will meet the hoped for goals.

SAMPLE SURVEY SHEET

Building

How many kinds of materials in the building? List them.

If the building was not all built at one time can differences be seen? List some differences.

Are there any habitats in or on the building? Look at gutters, in basement or boiler room, under eaves, by doorways.

Grounds

How many types of trees are there?

Check any features as listed below:

Gravel area either on playground or lot_____

Ground area without any grass_____

Low area that often has standing water_____

Planted gardens or flowers_____

Area with many rocks_____

Slope of ground_____

Asphalt court_____

Area not regularly mowed (often near fence)_____

Area with several trees close together_____

Wooded or brush covered area_____

Planted shrubs or bushes_____

Stream_____

Grassy area_____

Surrounding Area

Vacant lot within walking distance_____

Park within walking distance_____

Private property with wooded area nearby_____

Pond or stream nearby_____

Once the area has been surveyed a master plan should be considered. If the program is to be carried on over a period of years a master plan should be drawn up. In order to make the school site a better place for learnings as well as a beautiful and pleasant environment, selected plantings should be planned. The Soil Conservation Department of the government has specially trained experts that can give a school expert advice on planning growing things as well as the proper use of the existing soil bank. Certain areas should be left uncut for learning purposes and the maintenance crew should be included in the planning so that they understand the reasons. Trees can be obtained, for a small sum, from the forestry department and space not being used for school needs can be converted into a micro tree farm, both for the benefit of the students and for the protection of the soil. A school garden, if space permits, can be a wonderful learning experience. Parents should be involved in both the planning and actual execution of the program. It should be emphasized, however, that the PTA or other groups should not be handed the job of the plantings. Only if the children are involved, will the learning take place, and when they are involved they will take responsibility for its care.

Making the school site beautiful is but one step in the program of environmental learning. The many problems found on almost any site will lend themselves to many discussions, solutions, and, hopefully, involved activities.

In using a vacant lot or private property permission must be secured from the owner. Most people are happy to have an area used if they understand why and if certain rules are followed. One important rule would be that the children would not use the area except under supervison. Another assurance for the owner would be that the area would be kept clean and that except for needed trails, nothing would be cut or destroyed. With today's legal awareness most private citizens are afraid of someone getting hurt on their property so a statement should be signed by the school that the study area would be treated as any school area and that the owner would in no way be liable for any accident that might happen. With these important matters understood by all concerned, most people are willing for schools to use their land for educational purposes and this, in itself, can be an important learning for the students.

The entire process of obtaining permission, of setting up ground rules, and of course, thanking the owner should be the responsibility of the students.

SECTION II

Building a Nature Trail

A Nature Trail is a structured path that is set up to impart information about some of the things found along that specific path. It can be a self-guiding type of trail, with signs and labels or the trail can have a booklet that gives more information than the signs can convey. Students can act as guides for classes using the trail.

A Nature trail is one of the easiest ways to impart nature lore and stimulate people to want to learn more about the out of doors. The purpose of a school nature trail is to point up all of the fascinating things that students can discover on the school grounds or a nearby vacant lot. Be sure that the students do most of the planning and work in making the trail as this can be both fun and very educational. They will need some guidance, of course, in finding where to put the trail, how to select things to be labeled, how to make the labels and what to say on them. A trail can be built on any type of school grounds. A site that has woods, a stream, or open field area will, of course be the easiest to use as a nature trail area. The urban school grounds, however, no matter how barren, can be used to tell the story of how man has changed the land. The natural community, found in cracks, in the corners of parking lots or on the play area can be compared with the man made materials and changes in the city community. Here are some general suggestions for setting up different types of school trails.

Near your school there probably are trees, shrubs, ground covers, hedges, grass or other growing plants. It is important for the children to be made aware of the growing things around them, to observe the conditions under which the plants live, and to watch their changes through the seasons. The children may also enjoy identifying some of these plants. They can make a trail that consists essentially of a map showing the location of the plants and a list of their names, keyed to the map.

A.

1. Have children make a survey of the neighborhood near the school to locate any plants that are growing there.

2. Draw a map, with the class, of the area to be used and mark on it the locations of each of the plants included. Number these locations.

3. The children may consult any of the following sources in establishing the identity of the plants: the school plans, the custodian, Environmental Education consultant, local garden clubs, conservation and soil departments, state naturalist, or a reference book.

4. List the names of the plants with their numbers. Note also on this list outstanding characteristics of the plants, interesting information about them and a brief description of where they are growing, such as: in the school yard, between the sidewalk and the curb, in a crevice of a wall, in a crack in the sidewalk, etc. It may be possible in some areas to secure permission to place identifying markers in front of each plant shown on the map.

5. Include any other interesting features which may be found in the area, such as boulders, outcroppings of bedrocks, signs of erosion, or animals' homes.

6. Give each teacher in the school a map and the list of plants.

7. Have classes watch for and issue reports on seasonal changes in the plants and the insects and birds which may be visiting or living in them, and on how the plants are affected by these animals and by the weather.

8. Plan to keep this trail accurate and up to date.

1. Setting up Stations:

A station along a trail is a spot where there is an item or area of interest that needs more than a sign or label. Several concepts can be found in areas along the trails and these can then be grouped into a number of stations. These stations should be marked with a number. The booklet written for the trail will have material for each station. On some school sites it may be impractical to put up signs and labels. The station signs and booklet would then offer the best way to set up a trail. The trail itself should utilize the best teaching features of your site or lot. The entrance should be conspicuous enough to attract attention, near the school building but the area should be protected from being overrun by groups with other interests. The trail should have as much variety as possible. As the students first walk the proposed route of the trail they should pick out points of interest or special things. Some of the stations may be of general nature, such as habitats of animals -- certain habitats can be pointed out at that spot, a dead tree, a stream, the foundations of an old house, a birds nest - all of these can be used as a central theme for a station. Even if the guide booklet is changed to fit the seasons, the basic stations can remain the same. Once the stations are decided on, the special types of trees and plants and any points of interest between the stations can be labeled.

2. Labels and Signs:

There are many ways to label a trail. Much depends on the age group using the trail and how many signs can be put up. If the trail is located on an urban school site, with few trees and little green area, the labels should be few in number. Usually a label will do more than just give a name. It may pose a question or be a part of a series of signs all giving special information. It may give its information in a rhyme or refer to something the students may have in their school books. If the students work in groups they should be encouraged to discover things along the trail that they want to share with others through the labels. This is not a static project; each season brings on more changes to be discovered. If more than one class is working on the trail, each group will want to make its own discoveries and make labels of its own. It is usually easier to organize the building of the trail by rooms, allowing each group a certain number of stations and an area between stations as its prime responsibility.

The labels should be as original as possible. They should tell more than a name. If the item is a tree, the label should tell if this is a native tree, or if brought into this area, why it was brought. What use do we make of the wood? How did a certain flower get its name? What use might the Indians or pioneers have had for the bark of this tree?

It is important that the students become acquainted with the conspicuous habitats along the trail. The labels should not only include the plants but also soil or rock formations, or a spot where a bird is nesting.

The labels or signs can be of different kinds. The simplest and easiest labels are made from

good grade shipping tags. These should last throughout the school year. Since these are not permanent, this makes it easier to make new signs with another class the next year. These signs can be lettered with a marker or India ink. To waterproof the signs either spray them with a clear plastic or dip them into melted wax. Don't try to use a typewriter unless this is part of the experience for the children. The type does not hold up well in the weather. More permanent labels may be made of wood, masonite or metal. Plastic tags with a special writing pen can also be used *(see reference for address). Pieces of tin can be cut and painted white. Waterproof ink can be used for marking. The wood or masonite can also be painted and used with the waterproof ink. These should also be covered with a varnish or waterproof plastic. Some signs can be printed on cards, glued to the wood and then varnished. Be sure the glue and varnish is waterproof.

The Boy Scouts of America have an excellent set of Ecology cards and tree cards (geographical area sets) that can be used on a trail. The cards have a wax coating but it might be better to mount them on board and varnish them. The signs can be put on trees, (wired rathered than nailed), or put on stubs in the ground. The baggage tag labels can be attached to the object itself. If there is no place to fasten a sign or drive a stick, the post can be put into a can with some cement in the bottom. The can should be large enough so the sign will not make it top heavy. The signs can then be put out at the proper place whenever the trail is to be used. This is some trouble but placing them on the right spot each time can also be more educational for the students. A set of seasonal signs can be made so the trail can be used at all times of the year with different labels. Special labels may be put up for certain units of study. A set telling the story of pioneer and Indian uses of the materials found on the trail would work in well with a study of settlers or the history of the state. As new flowers bloom in the spring the children will want to watch for each new arrival and label it for the trail. One way to get all of the students involved is to let each "adopt" a tree. By learning its names and all about it, each child can add a label to the trail and yet not have to learn all of the trees. Directions for making labels and suggestions for possible labels are included at the end of the section.

A conservation project might be included as a station on the trail and this should be labeled as to the problem and what was being done. On some urban sites a station and signs about urban problems might be included. This might be litter, with a wire enclosure holding all of the litter gathered from the site. Reconstructing a house and family that once lived on the lot -- a type of Archeology, can also be exciting and fun.

This may call for special labels -- making the labels is an excellent way of getting the students to do research as well as develop the skills of conveying much information in a small space. This is one area that even the slower students can participate.

3. Self Guiding Trails or Student Guides:

In most instances a good nature trail will need to have both types of guiding devices. The self-guiding trail not only uses the student prepared labels and signs but also a booklet. Where trail markers or labels are not feasible the trail guide can include the material that could usually be put on the signs. The trail guide booklet (examples on reference page), will usually give more detailed information than could be put on the signs. In some guides teaching devices can be used. Unanswered questions and suggestions for certain types of activities using the senses could also be included. The students should write the material themselves. They should be cautioned, however, not to copy directly from a book, but to put the research into their own words. If they find a new word, they should change it into another word that means the same. A group may want to make several booklets, one for each season of the year, or for special things such as trees or uses by Indians and pioneers. They may wish to

make trail guide booklets on grade levels -- one each for K-2, 3-4, and 5-6. This would mean extra work in finding out the vocabulary of each grade. This can be an excellent way of getting the slower students involved in writing, by allowing them to do the guides for the younger children. The K-2 booklet would have a great many pictures and this would allow those students who excelled in art to use their talents. The front of the booklet would also need to be designed by a student.

The student guides can be organized in several ways. Several students can be used as guides to take other classes along the entire trail. Since these, of course, would have to be the better students, this might only be used to start off the project. In order to give oral language experience to as many children as possible, "living labels" can be used. One or two children can be stationed along the trail at each station to tell the groups what is to be found at that spot and answer any questions. Another way to provide experiences would be to have children beside each sign or label along the trail to read the labels to lower grade classes.

There would need to be other organization in the classes in charge of the trail. Someone would need to be appointed as the person to set up schedules for visiting classes. They would be responsible for getting guides or seeing that the group got booklets. In addition, if the signs had to be placed at the stations or signs put on the trails, a committee would need to be in charge of putting out the signs. A group of "Litter Police" would need to check the area to make sure it was clean and ready for a group to visit. The committees who made the signs or labels would need to check every few days, particularly in the spring, to see if new signs needed to be made.

Some older classes using the trail might wish only to use the guide booklets and these would also be given to parents and people visiting the trail.

In setting up the trail it would be of great value to the teacher to get the help of volunteers, either from a community agency or parents. In this way small groups of children could work on different aspects of building the trail. By involving parents and interested outsiders a great deal of interest will be generated in the project. Many communities have people who have skills in the out of doors and who would be happy to assist the class in making the trail.

A map of the trail can be included in the booklet or put on a sign at the start of the trail. This will give the children experience in using a compass and in learning about pacing and distances.

Clippers and rakes may be needed to clean the area. A spot at each station should be cleared so the group can stand together to listen to the guides. It is difficult to talk to a group strung out along a trail. If the teacher is leading the group she should not try to talk as she walks but rather stop at certain spots to discuss what has been seen with the group.

4. Problems on a Trail -- Vandals, Changes in Seasons

In many areas the problem of vandalism is becoming increasely important. Not only are items destroyed but those left standing are often covered with writing or paint.

Since a school nature trail would usually be put in an area readily accessable to after school visitors the problem of vandalism may be one of prime concern. It is very discouraging to both children and teachers to find hours of work destroyed overnight.

There is no single solution to this problem but the fact that the children themselves are actively involved in the trail will often make for a sense of responsibility towards the project. School children in the neighborhood will often keep an eye on the trail and help to prevent any one tearing it down. This is also true for school gardens and school site plantings.

If the situation on a school site is difficult to handle the trail can be made mobile. All of the signs and labels can be made portable by putting the post into cans filled with cement. The trail will have to be put up each time it is to be used but this can be an educational experience for the children. Hooks can be put into the trees and the tree label can be hung on the hooks before each use of the trail. One of the main reasons for building a trail is to teach about the out of doors. When a child has learned to love and understand the out of doors he will usually also feel a responsibility for it. This can be the best answer to the vandal problem.

If you are sure the trail would be torn down, make it a mobile one; if not, put your signs up and hope. The children may be the best judge of what might happen to the trail and they can also be the answer to saving it.

There can be problems on a trail other than vandals. Poison ivy will often be found in areas that are suitable for a trail site. If there is not a great deal of the vine it is best to leave it where it is growing and put up either stakes and red cord or a danger sign near it. Some should be left in order to teach the children how to avoid it. If there is a great deal growing near the path a herbicide should be used to dry it up. Do not attempt to pull it up, even using gloves.

Other problems that might be found in a trail area are overhanging limbs and steep spots on the trail. Usually the limbs will not fall unless there is a heavy wind and since it would be unlikely the trail would be used at this time the only problem would be in removing the broken limbs. Steep spots on a trail can be used as part of the learning process by using them to teach soil erosion.

Steps made of logs or railroad ties can be put in the slope and pegs driven into the ground in front of the steps. This will not only be safer for the groups using the trail but they will help keep the soil from washing down the slope.

Some problems on a trail are not adverse ones. The changing of the seasons can make many signs and labels obsolete. This will keep the trail from becoming static and new signs can be made. Each season will bring new and different adventures to the trail and the students will never become bored with it.

5. Identifying - Pro and Con

Most nature trails include labels identifying trees and flowers. This can be a learning process for students, both in doing the identifying and in reading the labels. In the past, how-

ever, too much emphasis has been placed on knowing the names of things and not enough on where they are living and their contribution to our life. Many a child has been "turned off" "Nature study" because they had to learn ten trees or six flowers. For younger children the names have very little value. For grades 5 and above identifying can be another method of teaching the scientific process. Signs and labels should include the name but the main thrust should be on how the tree or plant is used and why it is growing in this spot. If a child is told a name he will soon forget it but if he comes to want to know the name because he knows and understands the tree as a friend, then the name has some meaning.

One way to start students learning names and classification of plants to let one or a group "adopt" a tree. They can learn as much as possible about their tree -- in all seasons - and of course, like all friends, they will want a name by which to call it.

Names, for names' sake should be discouraged. It is far better to know by observation that a certain bird eats insects, or doesn't flap its wings as it soars in the sky then to merely know a man-given name.

6. Games and Quizzes on the Trail

In addition to the labels and signs on the trail many games can be included. The baggage tag can be used for many forms of quizzes. One type is a contest with each tag having two possible answers. Each answer has a number. The child will select one answer and add the numbers of each card to get a "magic" number (i.e. if this plant makes its own food take 5 points; if it lives on other plants take 3 points). After each student has seen all of the tags and obtained an answer from each, the magic number can be told. The students should then go back to each tag to find the correct answer. This game or quizz can be used as a final test on some area of nature, or one group can make up a set for another group. It can be used with younger students who are unable to read by having the teacher read the two questions and instead of using numbers having the children draw either a square or a circle.

The tags can also be used with questions and answers with a question on one side of the tag and the answer on the other side. These names can be used in any area of the curriculum.

Another type of quiz might be to have tree-identifying signs along the first part of the trail but on the last part of the trail have hooks on the trees. Each student might be given a baggage tag with the name of a tree on it and told to look closely at his tree on the first part of the trail and then tie his tag to the hook in the tree that is the same. For smaller children the tags can have a print of the leaf or a pressed leaf put on the tag with clear contact paper. The child would then find a tree with a similar leaf.

A type of treasure hunt can also be used but caution should be used in not having the children pick up too many items from the trail. If every group did this there would be nothing left of the trail. Such nature hunts might include five different kinds of leaves, evidence that some animal had eaten a meal; written evidence that the student had found a habitat, something soft and hard, rough and smooth, furry etc., or a twig shaped just like their teacher.

Games can be played with sounds, or with "fingerprints of trees" (either rubbings of bark, or the bark texture taken by pressing plasticine clay on the bark).

Somewhere along the trail there should be a place to sit and play quite games. Many times tree trimming companies will bring you slabs of wood that can be used as seats. The quiet game area can also be used as a spot for outdoor story telling or reading a book. There are several

good books on nature games including in the reference.

Making up games for each other can be lots of fun for the students but also they can be excellent learning experiences. The slow learners might not only learn a great deal by making up games for lower classes but also they can gain a great amount of self-esteem.

A great deal of imagination can be found in most students, and working up quizzes and games may often be the way to use this talent in a creative manner.

7. Using the Trail as Enrichment for all of the Curriculum (by grade level)

Most teachers using the out of doors as a classroom place a great deal of emphasis on the area of science, and certainly a great many concepts taught in science are better taught "where the action is". It is possible, however, to teach some concepts from all curriculmn areas. Each grade level can better learn some things in an involved interesting atmosphere. The Nature Trail can be the place for enrichment in every area.

The following suggestions are merely a few ideas for each area. Several of the books listed in the bibliography will give many more suggestions.

A. Language Arts on the Trail (Primary grades)

1. One readiness for reading activity can be in the area of likes and differences. This can be both for color (in the fall) and in shapes of leaves. Along the trail the teacher can have each child gather several different kinds of leaves. They can match up leaves of trees as they walk. Back in the classroom several types of games can be played with the leaves: "Simon Says" hold up a leaf like this; or "Grab the Bacon" with two lines facing each other with leaves lying in the middle. Each child on each line has a number. The teacher or student leader can hold up a leaf and call out two numbers. The children with those numbers try to grab the right leaf and take it back to their line without being tagged by the other student. This can be played with older children by calling out the name of the tree.

2. A feel board, with new words can also be made. As the class moves along the trail the teacher may ask that each student find something that is fuzzy, hard, soft, rough, heavy etc. Each term is suggested at one spot. One object found by the students is then selected as the best one to answer the description given. The rest are put down again, this keeps the trail from being stripped of natural things. When one object fitting each description has been gathered the objects are taken back to the classroom and glued to a board. Beside each is put the word describing it. Then each child can go to the board, feel the object and see the word that fits the description.

3. When something different is seen on the trail the group can try to list as many words as possible about it. For part of the trail a sound can be given the group words that start with T for example. They look for these words until the teacher stops again and then try to give as many words as possible. This is excellent for learning new sounds. The group can also try to use words and later write them down that have the beginning sound of an object and describe that object the tall tree toppled towards the two trucks. This can also be used with older students with more difficult words.

4. The children can describe some object with as many words as possible and then classify the words in relation to categories such as color, size, shape and texture.

5. Using the senses is also part of language arts. A chart can be prepared listing each sense or with small children a picture of something related to the sense. As they walk along the trail certain items can be pointed out to them and they would place the name or a picture of the object under the right heading. Many would come under several headings.

Language Arts for Older Students

6. Many of the activities listed above can be upgraded to fit older children. A certain object can be chosen as a tree, for example and each member of the class can try to give a descriptive word about it. One student can be chosen as a recorder and takes a clipboard with him. They record all these words and put them on the board when the class gets back in the classroom. Then

the class can use these words in stories and in writing Haiku (poetry where the first line has five syllables the second line seven and the third line five).

7. Organizing information is helpful in language arts. The class can be divided into groups, allowing each group to go along the trail by themselves and select some object. Each group will then write clues, statements giving information about the object. The rest of the group will try to guess after each clue what the object is. At the final clue a check can be made to see which clue gave away the identity of the object.

8. The labels, signs, trail guide and interesting notes along the trail are an excellent way to teach language arts.

9. The class can write interesting "Find Out" signs for the walls of the halls. These can ask questions that can be answered by using the nature trail and will create interest for the trail and its use.

10. If the class or individual "adopts a tree" or is watching seasonal changes on the trail, a personal trail diary can be kept. Each child can add a page, perhaps with pictures, every time they use the trail. They can also choose a certain area of the trail and "report" on that community.

11. A newspaper can be written about one of the trail communities, as if it were for them--- i.e. a rotting log, new arrivals, news from the ant hill, Mother Ladybird has six babies, new house for Tom Termite, etc. For the school articles can be written on changes along the trail- storm damage, etc.

12. Tall tales and make believe legends can be written. "Why?" stories "Why does a rabbit have a short tail?" or "How did the Black Eyed Susan get her name?" A tall tale can be made from things they may have seen along the trail. Get the students to pretend they are six in. high and write an adventure story about their trip along the trail or a creek.

13. All of these writings and stories can be collected into a book that the class might "publish" as their book.

B. Social Studies on the Trail (Primary grades.)

1. The trail can be used as an introduction or enrichment in map reading and making. For younger children this can be in the form of directions- north, south, etc. If a map has already been made by the older classes, the group can take it with them on the trail and find the important spots, such as station signs, special landmarks and the beginning and end of the trail.

2. A comparison can be made with natural and man made communities. Using such things as food, shelter, etc. the children can compare different habitats with their own man-made things. A study can be made of animal homes as contrasted with people homes.

3. After a trip on the trail discussions can be considered on such things as weather and clothing, with discussions of animals that live in different places.

4. Comparing insect activities with human occupations can also be another topic for discussion: Diggers of tunnels (bark beetles,) lighting experts (lightning bugs), masons (Dirt Daubers), paper makers (wasps), dairy farmers (ants milking aphids), nurses (ants taking care of eggs), "chefs" (honey bees making pollen bread and honey), garbage men (beetles) and many others.

5. Study a tree stump to find its age. Mark on the stump such "dates" as "How old was this

tree when we were born?" Or "How old was this tree when the school was built?" Other community and school facts can be found on the tree stump. A rubbing of the stump can be made and taken into the classroom. Flags marking each event can be glued to the rubbing and ribbons leading from the flag to pictures of the event drawn by the children. This can also be developed further by older children. It ties in well with language arts also.

6. If the children talk about land forms such as hills, streams, etc. in the classroom they can also find these land forms out of doors. After a rain there is an excellent opportunity to see how water will cut a canyon or make a delta.

7. If the children study pioneers or Indians a trip along the trail can be used to see how pioneers and Indians used the land--- how many plants could be used for food, for clothing (dye), for tools, for seasoning, or medicine. Many of the natural materials can be used in the classroom to help the children understand how the Indians and pioneers used the land. Several books giving this information are listed in the references.

Social Studies: Older Students

Many of the above activities can also be used with the older students.

8. The making of a trail map can combine social studies with math. Learning to read and use a compass, learning to pace off distances and how to mark slopes can all be learned on the trail. Each important thing along the trail can be put on the map and translated into symbols. From this experience students should be better able to use maps in their social studies work.

9. If the class studies about foreign countries the trail and school site can be used to find micro-climates that are like the countries studied. They might even wish to set up a miniature "city" for each kind of climate. Each micro-community can be studied from the standpoint of why different things grow in each climate and how this might affect people living there.

10. The studies of Indians and pioneers can be carried further by learning why pioneers moved on (wore out the land), and why Indians were good conservationists (used all they killed, took only what they needed). This can lead to a discussion of what the pioneers left us and how it affected our life today.

11. Most communities have some nearby points of interest. If they are within walking distance use these as a focal point of a lesson.

12. On the trail discuss how nature lives in communities. See how many food chains can be found. Discuss recycling in nature: The producers (green plants), the consumers (human, animals,) the decomposers (fungi and insects). Help the children understand how the balance of nature works and how man, by changing the environment, can destroy not only one thing, but all things that depend on that thing. Along the trail ask the children to pretend that one certain object is to be taken away (i.e. a tree). Then have them figure out how many other things in that community would be affected.

13. Compare man's inventions with things used in nature. Some of these include the bees fanning their hives in summer as compared with our fans, the methods plants use to pack their seeds, the "air bubble" used by some insects to go under water, goggles used by the frog under water (his eye covering), jet propulsion of the dragonfly in the water, the parachute of the dandelion seed, and many others.

14. A study can be made of the trail using such terms as "city," neighborhood, home (habitat), environment, etc. These can be related to the trail and the child's own environment.

C. Science

One of the best ways to use the trail with science is through the seasonal changes. By linking together everything that lives in the natural community the basic concepts of ecology can be learned, as well as an understanding and appreciation of the out of doors.

Ideas for Science Learnings for Primary Grades

1. Find as many animal homes as possible along the trail.
2. Try to find out how each animal fits his shelter and food, structure of his body, his color.
3. Look closely at a tree. Find animals living on it. How do birds help a tree?
4. Look for tracks of animals in muddy spots along the trail. Make prints of the tracks.
5. In the fall or winter look for buds on the trees.
6. If there is a stump along the trail study it for its age and what might be ahppening to it now that it is dead.
7. Find as many seeds as possible and see how they travel.
8. Count how many kinds of plants are growing along the trail. Notice if all of them grow in the same kind of area.
9. Watch for an ant hill. Put a little food near the ant hill and be sure the ants find it. Watch them go back and forth in a single line getting the food back to the anthill.
10. Look for insect galls on stalks or leaves. Open one and see how a "bed" has been made for the egg. See how many kinds can be found.
11. Look for signs and animal has been along the trail--- half eaten nuts, tracks, eaten leaves, droppings, feathers, fur and other things.
12. See how many kinds of rocks and fossils are found along the trail.
13. Watch for areas where the soil has washed away and notice how much harder the ground is in this area.
14. Take magnifying glasses on the trail and study how a leaf is made. Take a close-up look at moss and lichens.
15. See how many different kinds of leaves can be found along the trail.
16. Listen to all of the sounds- natural and man made. Discuss which is more pleasing and which can be heard the best.

These are just a few suggestions. Curriculum Enrichment Outdoors by Hug and Wilson is filled with many ideas for other activities along the trail.

Ideas for Science for Upper Grade---

17. Find out the effects of people walking on a ground cover. Test how quickly water will be absorbed by the earth by using two cans *(directions on sample sheet).
18. Compare temperatures along the trail- in sunlight- on the path, under bushes, on a rock. How does this affect the plants growing there?
19. See how the insects differ along the trail. Why are they different?
20. Calculate the height of the trees. Why is one taller then another?
21. Study the community of a rotting log. Who is helping to turn it back to soil?
22. Learn to use a tree key, and find unlabeled trees on the school site that are like those on the trail.
23. Make a tree census and figure how much the trees on the trail are worth.
24. See how many habitats can be found and figure the food chain for each area.
25. See what different trail plants grow in the sun and which ones grow a shaded area.
26. Find both evergreen and deciduous trees. Try to find out how they are different.

D. Math Activities Along the Trail

Many math concepts and activities can be used with the social studies. Map and Compass use: Learning to pace and figure distances will also be helpful in map making and in other activities.

Primary Activities

1. If the students are using the "new" math the concept of sets is easily taught along a nature trail. Nature started this long before man used it and in leaves and flowers one can find many examples of sets that will help to explain this term and its use to students.

2. The vocabulary of math can also be taught on the trail. Finding and arranging leaves, sticks or rocks in order of size is one way to teach the use of longest, shortest, etc.

3. Counting trees with the same type of bark is one way to teach both math and the fact that all trees are not alike. Using left and right, tall and short, long and short, wide and narrow. All of these descriptive words can be used during a walk along the trail. What do you see high in the sky? What is higher than that? What is the highest thing you see? The list is actually endless and will help the children with concrete examples of words they see in their math book.

4. The students can gather leaves and use them in the classroom to show numbers from one to ten, sets of numbers or three of one shape and four of another shape.

Upper Grade: Math Activities

5. The origins of measurement can be very interesting to children and learning to use their body as a tool for estimating will be useful and exciting.

The group can be lined up with their toes on a line and walk 12 steps with "boby steps" - toe to heel. When they stop it can be pointed out that a standard number for a foot had to be established since each person does not have the same size foot.

6. There will be more discussion and a work sheet on personal measurement in Section III but many types of estimating can be done along the trail and then, as far as possible, the correct answer found.

7. The measurement used in weather is also useful along the trail. Reading a thermonmeter and figuring out wind speeds uses many math concepts.

8. In the area of science on wh re plants grow, graphs can be made to show the differences in several areas. These can show amount of shade or sun, differences in temperature and other factors affecting the growth of the plants. Numbers of trees that are of a certain type or a certain height along the trail can also be explained by graphs.

9. If there is an ant hill along the trail a study can be made of the travel rate of an ant. Using a minute as a time period the children can measure the distance traveled. They can then figure how many body lengths of the ant were respresented by the distance traveled in the minute. The children can then figure this in regard to their own body-- how far they might travel, using their body length, in a minute and see if this is the same as the ants travel. The miles per hour can then be figured. They may want to do the same with an ant carrying a load to see how close the two length would be. To further their study they might estimate how fast they might run on the school grounds. Graphs can be made of these activities.

Art and Music on the Trail

Many activities in both art and music can be started on the trail and then finished up back in the classroom. Some can be done while the children are on the trail. These creative experiences can also be used with language art, by creating the music and art for a story or play.

Art for Primary Students

1. Discovering shapes and patterns are very important as a first step in arts and crafts. The many colors and shades of colors along the trail can help the child understand more about colors. Using homemade clipboards, let the children try outdoor sketching, trying more for shape and feeling them for details. The many shapes found in nature can help children to learn to draw using shapes and then refining them. Heart shaped leaves, triangles, square stems of the mint family, and circles can be used to try design pictures that can later be made into more finished pictures.

2. There are many things in nature that can be used to make pictures. If each child takes a plastic bag with him on the trail he can pick up twigs, stones, bark (not from a living tree), dried grasses and seed pods. This also gives the leader a good chance to teach about conservation--leaving things for other people to see, and not picking flowers unless they are weeds in a field and there are at least 20 flowers for each member of the class. These materials can be taken back to school and be combined into a picture. Use heavy cardboard or wood as a backing. Stick men and animals are easy to make. Stones can be used for heads, and shapes of stones used for ducks or whatever they appear to be. Maple wings make good bird wings or fish. Caution the children not to pick green things to use in their picture as these will soon dry. Usually there are many dry grasses and flowers along the trail that can be used as trees or grass. Dry leaves can be cut to make dresses and bodies. Log cabins are easy to make with twigs and bark roof. Small rocks can be used to make the chimmey.

3. Small rocks can be painted to look like "bugs". Use pipe cleaners as the antenna or find dry grass with an end on it. Good insect books will have many ideas for the children. The Ladybird beetle is a good simple one to try.

4. Leaves can be used to make many kinds of prints. One of the simplest ones with children is a crayon print. The leaf is put, vein side up, on a piece of cardboard. Put a thin piece of paper over the leaf and rub with a crayon. Several colors can be tried to get different effects. Overlapping leaves will also make an interesting design. These designs can be used in making letter paper, Mother's day cards or put on the front of a scrapbook.

5. Scrapbook covers or placemats can be made with wax paper. Leaves can be ironed between two pieces of paper and the edges cut with pinking sheers to produce a nice edge. Clear contact paper is the new way to show off leaves and other natural items. The items should be put on the clear contact first and then the contact paper put on the backing and smoothed towards the edge. Seeds and other natural objects can also be used with the contact paper.

6. Ozalid paper prints: This paper can be bought from any blueprint store. It is much easier to use than blueprint paper as it is not as prone to fade quickly. The leaf is put on the paper, uaually on a hard surface such as a book or board. If there is clear plastic or glass around it helps to put these over the leaves to hold them in place. The leaves on the paper are exposed to the sunlight for about ten seconds. The area around the leaf will fade to a dull white and leave an outline of the leaf in yellow. Take the leaf off and (important!) after writing the child's name on the back of each print, put the print into a large jar with a top. Inside the large jar put a small (baby food jar is good) jar filled with household ammonia. This jar is left open. The fumes of the ammonia will set the print. The paper can be bought in blue, red and black colors and will make the best prints (outline) of any materials.

Arts and Craft Activities for Upper Grade

All of the activities listed for lower grades are also fun for the older students.

7. Collecting spider webs: Materials needed include spray paint (white), dark big construction paper and a pair of scissors. Try to find a spider web that is on a fence or is open so you can reach it. Spray the white paint on the web. Put the dark construction paper up against the side of the web that has been sprayed. Have a child carefully cut all of the web strands holding the web to its support, then remove the paper. The paint will make the web stick to the paper and show its design. In order to preserve it use a coat of plastic spray. There are many patterns of spider webs and these can be used in insect study as well as a decoration for the room.

8. An art activity that can be worked into social studies is the making of Diaoromas. This miniature scenes, made in a shoe box, can be constructed of natural materials- for example, African or South American jungles with huts on stilts. The roof can be made of twigs with either cloth or leaf clothes. Animals and people can also be made of clay and painted.

9. If there is a study of the American Indian there are many crafts that will help teach the interesting history of these people. The children can paint like the Indians did, using either soft rocks (usually chert) ground into a powder with linseed oil added to make the paint. This of course makes only earth colors, so the children may want brighter colors for their picture. If there is a field or open area along the trail or in the school yard many weeds can be found. Let the children draw an outline of a picture and then use natural colors to "paint" it. They should tear up the leaves, flowers, etc. before using them in order to get to the coloring matter. Be sure they use only weeds. The dandelion makes a beautiful yellow.

10. Natural dyes can be made from many things found on most school sites- poke berries, walnut hulls, and other plants can be used. Use big white handkerchiefs and try tie-dying. These can then be used as cowboy or pioneer scarves. A reference is given for using native dyes in the bibliography.

11. If corn husks can be brought into the classroom they can be used for many craft items. Dolls, mats and even sandals can be made from these. A simple loom is included with other ideas at the end of this section.

12. Pins made from "slices" of wood are easily done and very effective. The slices can be cut from a limb about 1 inch in diameter. If a smaller limb can be found (Sumac is excellent) earrings can also be cut. The slices can then be sanded to show the wood grain. A clear coat of plastic spray or varnish will bring out the grain. Pin and earring back s can then be glued on the back.

13. The same type of slice can be used to make I CARE buttons. After sanding, glue a small picture (nature stamps or cut from magazine) on the wood. Above the picture write I CARE with India Ink or Marker. These words stand for I Care About Resources Everyday. A pin back can then be put on the back.

14. Spore prints can be made from mushrooms. Cut off just the cap of the mushroom. Put the cap down on a piece of white paper and cover the cap with a glass. Leave at least 24 hours. The spores will drop down to the paper and leave a print of many tiny spores. The print can be preserved by carefully spraying the print with plastic spray.

15. An easy way for children to acquire a sense of perspective is to practice drawing out of doors. Seeing the difference in size of things far away and how they become larger as you get nearer to

them will help the students see perspective and use it more effectively in their art work. Using a small cardboard frame to "see" their picture also strengthens this concept.

There are many more ways to teach and use nature in arts and crafts. Several excellent books are listed in the reference and usually all it takes is a little imagination.

Music Activities along the Trail Primary

Many sounds in nature can be used to create songs and rhythm movements. As the children walk along the trail they can watch for movements of leaves, limbs, seeds and other things. From these a free expression of movement can be dramatized back in the classroom Have the children watch the movements of birds or any small animals. Back in the classroom the children can interpret the movements with their own bodies. They can also try to make up songs to express what they saw and felt and use these in their movements. A swaying tree, the whisper of the leaves, the fall leaves floating down- all can be the basis for both rhythm and music.

Many natural objects can be used as instruments. Seed pods, sticks rubbed together, a hollow log as a drum, rocks shaken in the hand or dried grasses shaken can give a new concept to the idea of rhythm bands. These "bands" can be the background for the creative body rhythmns.

Upper Grade Music Activities

All of the above activities can be done with older children but usually they are not as creative with rhythms as the younger children. They will enjoy making instruments and creating a band. More advanced instruments can be made from gourds, from whistles, different items being struck together and any other natural things they might find. These can be used against a background of recorded bird sounds.

The sounds in the out of doors can help the students learn more about music and tones of sounds. A woodland chorus using bird songs can be discussed. Listening to records or trying to record bird songs can help teach children how sounds are formed to make music. Either using a known tune or making up their own, the students can write songs about the trail and the things living there. They might want to try a make-believe ballad or a "dance" tune. The sounds of the out of doors can be used in singing. Patterns of a bird song might be part of a song or sounds the animals make. Tonal patterns can be used by expressing the music softly as in the early morning, louder when a storm comes.

There are many folk and other songs that are about nature. A group of children might want to research as many songs as possible that might be about the things found on the trail. These songs can be learned in music or used with the school "pipes".

BIBLIOGRAPHY

There are many books about the out of doors. The ones listed here were chosen because they can help the student and teacher better use the out of doors as a learning area.

Bale, R.O., Creative Nature Crafts, Burgress Pub. Co.

Bale, R.O., Stepping Stones to Nature Ibid

Brown, Robert E., and Mouser, G.W., Techniques for Teaching Conservation Education, Burgress Pub. Co.

Frankel, Godfrey, and Frankel, Lillian, 101 Best Nature Games and Projects, Sterling Pub. Co.

Hug, John, and Wilson, Phyllis, Curriculum Enrichment Outdoors, Harper and Row. Pubs.

Teachers Curriculum Guide to Conservation Education, People and their Environment, Grades 1-2-3 and 4-5-6; J.G. Ferguson Pub. Co.

Brown, Vinson, How to Explore the Secret Worlds of Nature, Little, Brown and Co.

Musselman, Virginia, Learning about Nature Through Crafts, Stackpole Co.

Musselman, Virginia, Learning about Nature Through Games, Stackpole Co.

Cooper, Elizabeth, Science in Your Own Back Yard, Harcourt, Brace and Co.

Urell, Catherine, The Big City Book of Conservation, Follete Pub.

Hawkinson, John, Our Wonderful Wayside, Whitman Pub.

Weaver, Richard, Manual for Outdoor Laboratories, Interstate Pub.

Pamphlets ---

Price, Betty, Adventuring in Nature, Nat. Recreation Ass't

Gaudette, Marie, Leaders Nature Guide, Girl Scouts of America

Home Dyeing with Natural Dyes, U.S. Dept. of Agri.

Nature Music, National Recreation Ass't

Shomon, Joseph, Manual of Outdoor Interpretation, National Audubon Society

Seymour, Marjorie, Nature Study and Activities, F.A. Owen Pub.

Conservation Activities for Young People, Free from Forest Service

Adventure in Environment, NEED Silver Burnet Co.

Sample lables

Baggage tags

If This plants make its food Take 4 points if it lives on other plants - Take 3.

If the roots of this Tree will make a Tea - Take 1 point If They can not be used Take 3 points

Question & Answer Tags

Why is This Tree diffrent from other Trees?

Answer Ithas 3 Kinds of leaves (sassafras)

For youngen children To be read by Teacher

If an insect could live under this bark draw a ☐ if he could not live there draw a ○

Tags or lables for Trees

This Tree was usd by both Indians and Pioneers. Bows arrows and orange dye were fewuses Osage Orange Tree

A Dead Tree

Nature uses everything - This Tree - helped by plants and insects will Turn to Soil

The wood of this Tree is used For Tool handles. The wood will absorb the blow — Hickory

absorb

If The Tree tops you will comb - you may see a Squirrel's home.

Look

How many things can you find that will Tell you some Kind of Animal has been here?

Give this tree a name - Look at its bark. How does it feel and look to you - what would you call it?

Here on this Tree are two Partners working together - where are they?

Answer on back Lichen.

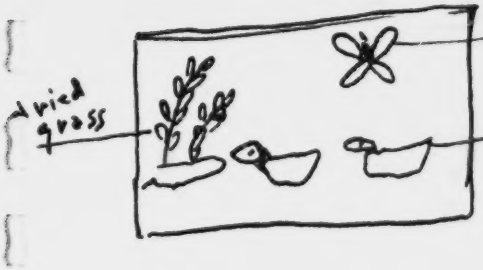
FILMED FROM BEST AVAILABLE COPY

Nature Craft Ideas

— slice of limb

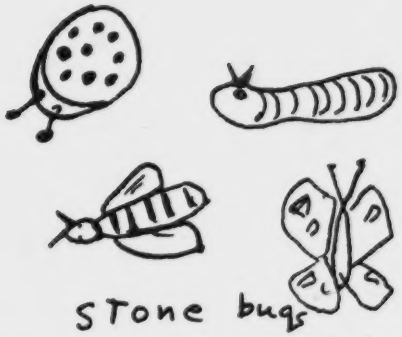
— I care pin

Nature Plack

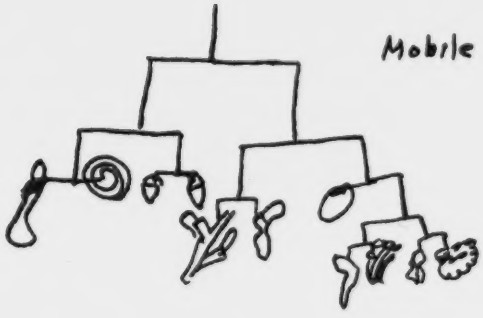


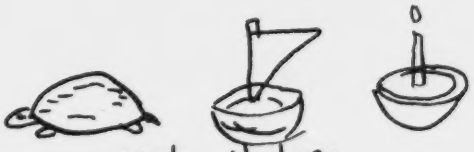
shadow box

cut dry leaves

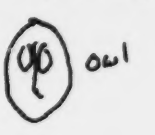


Stone bugs
markings Painted
Parts glued ½ white glue 1
½ mortem mix



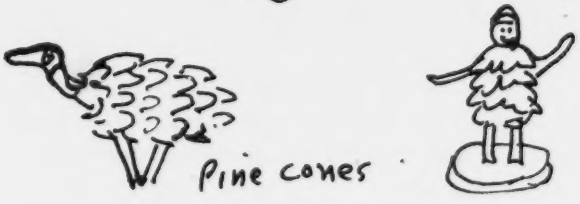


Nut Halves

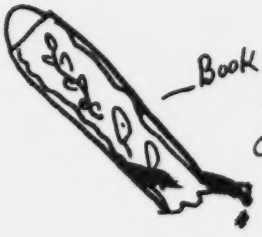


owl

Acorn heads



Pine cones



Book mark with clear contact Paper

Examples of Student Written Nature Trail Station Guide

Station I -- Conservation Project

The gully you see was caused by water washing the soil away so that plants couldn't grow. Until something is done no plants can grow. Without plants there are no roots to hold the soil. We have built a check dam. The dam will hold the soil back and still allow the water to flow. Once soil is banked behind the dam, seeds can be planted and then the roots can be held down.

The blowing away and sliding away of soil is called erosion.

Our most important natural resource is soil. Without it plants could not grow and plant-eating animals could not live. Without it, meat-eating animals could not live. Without it, meat-eating animals would also perish. Soil, like water and air, is necessary to all life on land.

Soil differs from water and air in one important way. The earth has plenty of air and water, but the supply of "usuable soil" is extremely limited. What is "usuable soil"?

"Usuable soil" is the layer of loose surface material often called topsoil, which contains plant food. The next layer or subsoil also has loose materials; but it has little or no plant food. Beneath this layer is gravel, clay or bedrock.

Plant life depends upon the topsoil. Along the lower courses of great rivers, the top-soil may be hundreds of feet thick, but in most places it extends down only a few inches or a few feet. The average depth on American uplands is estimated at seven inches.

The soil coating of the earth is thinner, comparatively, than is the fuzz on a peach. Yet without it all land life would perish.

Station II -- A Miniature Problem

Rain water turns muddy as it rushes down over the bare ground. As the brown water tumbles down, it cuts deep gullies in the steep parts of the hills below and washes more good soil. The brooks and rivers turn brown with mud.

This gully shows how a river could be formed. Notice how the big rocks are at the bottom of the slope. Leaving only small rocks above.

A real river would carry mud and sand to the mouth of the river and form what we would call a delta.

Station III -- Squirrel's Nest

Look up! Let your eyes follow the arrow. The squirrel's nest is easy to see because it is big and there are no nests around it. Squirrels homes round and made of dead leaves and sticks. A squirrel will often steal a bird's nest and put a new roof over it. The inside of the nest is lined with moss and grass to make a snug home.

In winter the squirrel lives inside a hollow tree.

Station IV -- Tree Roots

The roots of a tree grow down into the damp ground to find water. The main root is called the tap root. Smaller roots grow out from the taproot. Long thread like roots are called fibrous roots.

The liquid going up from the roots is called sap. Tiny tubes in the tree carry food to all parts of the tree. Some of this food goes back down to the roots to be stored. This food helps the tree to grow.

This tree split open. Notice how the sap has run out.

Station V -- Tree Stumps

If you look closely at this cut end of the log you will see circles in the wood. These circles are often called growth rings or annual rings. You can tell the age of a tree when it is cut by counting its annual growth rings.

This tree was cut here on the school site in November. By counting the rings you can see how big the tree was when the school was built. A flag (1) shows how big the tree was when the fifth grade students were born. A flag (2) shows how big the tree was when Metro Nashville was formed. How old was the tree when it was cut?

Station VI -- Holly Tree

The holly is an evergreen because it keeps its leaves through the winter. Three-year-old leaves are shed in the spring. The leathery dark green leaves have prickly edges and a shiny, slick coating that helps to protect the leaves in cold weather; thus helping the tree to stay ever green.

Only the female holly tree bears red berries. The red berry, which hangs on the tree all winter, contains four hard nutlets. This fruit is enjoyed by birds. They drop the undigested seed, which may grow into new holly tree.

Station VII -- Rotting Log

Our soil is made from small pieces of broken rocks, decaying plants, trees and animals. This rotting log will continue to break up and decay and finally will become part of the soil. Together with leaves and other dead plant and animal matter, it will enrich the soil. While it is still a rotting log it will serve as a habitat, or home, for many insects, bugs and worms.

Station VIII -- Habitat

A habitat is the kind of place in which a plant or animal usually lives in nature. Plants and animals live where they can satisfy their needs. They look for a place where they can find food, water and shelter.

A natural habitat may satisfy the needs of many different kinds of plants and animals. These living things form communities. Some of the habitats we can see are:

under a rock
under the ground
under the bush
in the dirt
in a tree
in a brush pile

BIBLIOGRAPHY

The following are just a few of the books and pamphlets that have ideas for using the school site as a study area.

Discovering Your Environment, Jones, Orville and Swan, Malcolm, Interstate Pub., Danville, Ill. A set of Spirit-Duplicating Masters with learning exercises.

Outdoor Activities For Environmental Education, Knapp, Clifford, Instructor Pub. Danville, N.Y.

Series of Environmental Units - Vacant Lot Studies, Differences In Living Things, Man's Habitat - The City, Nature Hunt, Soil Sampling, Natures Art, Wind, Shadows, Oaks, Acorns, Climate, Squirrels, Habitat Study, Transet Study, Activities Along A Transet, Measuring Weather, Tree Watching, Field Activities Package Outdoor Activities Collection, and others. National Wildlife Federation, Washington.

A Place To Live, National Audubon Society, Urban Ecology

Tips and Tricks In Outdoor Education, Swan, Malcolm, Interstate Pub.

Sharing The Earth, Earth I My Home, First Follow Nature, Look Around You, Scholastic Magazine. For Teachers and Students.

Science In City and Suburbs, Experiments Adventures In Environment - NEED Program, American Publications, Silver Burdett Company

Mini-Climates, Birds, Trees, Running Water, The Dandelion, Ecology, Mapping Small Places, Small Creatures, Your Senses, Mine Publications

Sciences Experiences, Living Things, Bendick, Jeanne, Franklyn Watts

Young Scientist Takes A Walk, Barr, McGraw-Hill

Young Scientist Takes A Ride, Barr, McGraw-Hill

How Much And How Many, Barr, McGraw-Hill

Learning About Soil And Water Conservation, Fox, Adrian and Rotter, George, Johnson Publications

Ranger Rick Magazine, National Wildlife Federation, has many ideas for getting children involved.

There are many books and units now being published with many ideas. The above are just a few.

SECTION III

Using the School Site and Community Without a Formal Trail

Exploring our Street — All Grades

Objectives: To help the children observe what they find around them in their own neighborhood.

Concepts: Some materials are man made; some are natural. Materials are used when they are best suited to a certain job. Natural and physcial forces will act on both natural and man made materials.

Materials needed: Lenses, paper, pencil, dictionary

First Stop: Outside the school

Questions: Of what material is the school made? Stone, brick, wood, medal
Which of these is man made? Which is in its natural form?
Follow up on each of these answers: Brick is man made but made from a natural material -- Clay. Is there clay around the school? (You might dig into the soil and see if you can find any clay) If there is clay, could it be used to make bricks? Take some back to the classroom; let the children try to make small "bricks" of it. If it holds together, fire it in a kiln if one is available. Most of the clay will not hold together well enough; so in the follow-up discussion point out that clay must be gotten from a certain place. Is there any in the community? (Call a local brickyard to see where they get their clay. They will usually give you some they are using.) Does clay come in different colors: In many colors; Check with local brick stores; they have bricks in several colors. What would make the clay different colors? Mineral in the soil. Why are the bricks fired? If there is stone in the building, it can be examined for type, color and hardness. If it is limestone, a drop of vinegar placed on it will make the rock bubble. If there is a glitter to it, it might be calcite in the limestone or the minerals in granite.

I Bricks Questions:

1. Of what material is the brick made? Bricks are made of clay. They are man made from a natural material.
2. Where does the clay come from? There may be clay on your school grounds. Allow the children to take some back in and make small "bricks". If the clay holds together, try firing it in a kiln.
3. Why do bricks have to be fired? To hold the clay together. Show this by letting water fall on an unfired brick to show how it would "melt" away. Since most of the clay would not hold together, explain that good clay for bricks must be gotten from a certain spot.
4. Are all clays the same color? No. Call the local brick yard and find where they get their clay. Most yards will give you some clay. Get a sample of different colors.
5. Why are bricks made from clay different colors? The mineral in the soil makes the color. Find out the common color of clay in your area and find what mineral gives it that color.

II Stones

1. Did these stones come from around our community? The stones must be identified first to

know this. A simple test for Limestone, a common building material, is to put a drop of acid or vinegar on it. If it bubbles, it is limestone; otherwise, it is probably granite. Check to see what rock is found in the area. If the rocks are limestone, show where the acid in rain has weathered away spots in the rocks. This would be true also of sandstone.

2. Is this the natural shape of the rock? Check to see if the rocks have been cut to fit or if they have been left in their natural state. Discuss the use of mortar to hold stones and bricks together.
3. What is mortar made from? A man made rock called cement. Man has copied nature in the making of cement, grinding up limestone and clay and adding small stones and sand. Man has learned to make his own stone and does not have to depend on bringing rocks from a great distance. Many houses are made of cement or cinder blocks. Cinder blocks are darker and coarser. A cement block is often hollow. It can still be strong enough to use as building materials and not be so heavy.

Tile: Some chimneys, roofs, and sewer pipes are made from tile. Tile is made like brick but has a glaze baked on it. Some tile will be used in restrooms and in the kitchen.

Other rocks you may find in the neighborhood are: Marble, made from limestone; shale, used in sidewalks; gneiss, and balast.

III Metals

1. Are the metals in the same state as when they were mined? Usually not; they are often too soft or there are some other features that are not good. They are usually mixed with other things and are called alloys.

Iron is one of our most important metals. It is easy to spot because it will rust. Iron is cheap and can be shaped well. It is usually painted to keep the rust away.

2. Are the garbage cans we use made of iron? These are made of galvanized iron. The iron is dipped in zinc. This forms a coat over the iron and helps to prevent rusting.

Most of the things you will see are made of steel. Steel is very pure iron. Sometimes things are added to the steel for special uses. A common nail has zinc in it. Tungsten is added to make strong tools. Stainless steel has chromium in it.

Aluminum used to be very expensive since it can only be gotten from the ore by an electrical process. It is very light. The pure metal is soft so it must have other things added to it.

Lead is used on cables. If you look closely where metal fences or railings are anchored, there will be lead helping to hold it.

Copper and Brass - Brass is made from copper and zinc. Both copper and brass are used in plumbing, door knobs, and in decorations. Copper is a good conductor of electricity so almost all cables are made of copper.

3. List the kinds of metals you find around your school.

IV Sidewalks and Streets

Many people and heavy vehicles will use the sidewalks and streets. Is a street level? Look at the center of the street. The "crown" is higher than the area near the gutter so the water can run into the sewer. (If you have a level, you can show this to the children and figure the slant.) If the sewers are not large enough after a heavy rain, many basements will be flooded. Even on a dirt road drainage ditches have been provided. Usually a street is made of concrete and asphalt. Asphalt used to be imported from the British West Indies but now most of it is made in our country. Its tar-like substance is what is left after other chemicals have been boiled out of petroleum. Asphalt is cheap and easy to work with, and it will expand and contract in the summer and winter without too much cracking. Some roads

are made of asphalt and small chunks of stone. This is macadam. Concrete makes a better surface for roads but it costs more. Since concrete expands on hot days, the roads usually have spaces filled with tar. Cement walks are the same. The cracks also help keep cracks in the blocks from spreading. The paper that is put down when walks are being laid helps to keep the cement from drying out too fast and cracking. Curbstones used to be made from stone, like granite, but today most are made of cement.

Under the Streets: Pipes, wires and many things will be under a street. Man hole covers will tell you what is under a street at that point. Wires are put into cables, many times of different colors so a repair man can tell which is which. The book, "What's Under the City", is an interesting one for children and can be used well for looking up ideas and drawing pictures. A follow-up to this discussion outside might be tracing lines into the school to see where they go.

V Telephone poles:

Select an area where there is a telephone pole with a transformer on it and one where there are some without. A telephone pole performs many different jobs. There are many things connected with it that most people never notice. What kind of wood is used in a pole? Have the children make a chart, as below. As questions are asked a reason can be put under one or the other heading, then crossed out as a solution to any problem is found.

	Hard Wood	Soft Wood
1.		
2.		
3.		

Possible Questions:

1. Which tree might be more resistant to insects? Why? Some hardwoods--hard to chew; some softwoods--because of the bad taste of sap or gum. Usually hard woods, however, so put the statement, resistant to insects, under Hard Wood.

2. What can be done to keep insects out? Soak and force into the wood creosote, a tar-like material. So soft woods could be used. Now the item under hard woods can be crossed out as a solution has been found.

3. Which wood would be stronger? Usually hard wood, so put thus under hard wood.

4. Which grows straighter? Look around and try to find a hard wood and a soft wood tree in the area; then look and see. Soft wood has less branches so it usually grows straighter. Put straighter under soft wood.

5. Which type of tree grows faster? Ask the children about which tree would be able to make food through its leaves. Softwood keeps leaves throughout the winter so it can keep growing where the hard wood tree does not grow in the winter. But grows faster under Soft Wood. In this same idea, there would seem to be more soft wood trees to pick from. (Back in the classroom a check can be made to find out how tall soft wood trees are in relation to hard wood trees.)

6. How is this pole repaired? Sometimes there are "pole steps" but not on most poles. The children may have seen climbing spikes used. If not, explain them: "Have you

tried to drive a nail into a board? Into an oak board? A pine board? Which is easier? (pine) Which is the soft wood? (pine) If so, which kind of tree would it be easier to climb up with the climbing irons? (Soft wood), so put this under soft wood. It can be seen now that the list under soft wood is much longer than that under hard wood so that it would seem that telephone poles are made from soft wood. In fact the one thing left under hard wood (stronger) is not necessarily true. The word "soft wood" might make the children think it is weaker. If the word "soft" meaning the grain is not as tight is explained, they can see the tree can still be very strong. Most modern poles are made of cedar or ponderosa pine.

7. Notice the things on the pole. What is the numbered plate for? (Identify it) When this pole is removed the same number is put on the new pole. You can report a pole damaged or a line down by the pole number. Notice the numbers and letters burned into the pole. This tells the grade of the pole, where it is to go, and how tall it is. By estimating the height of the pole you can figure how deep the pole had to be put into the ground. What are the wires running from the pole for (if there are some)? (Guy wires to help it stand up) Sometimes a part of an old pole is banded to a new pole. This is because the pole that was there is being used to mark a gas line or other gauge in a nearby yard. The spot is measured from the pole and since the new one will not be in the exact hole where the old pole stood, the old pole must be left as a reference point. Sometimes the pole is not in the ground deep enough and the other pole is kept for support.

   Since light and power lines, as well as telephone lines are carried on this pole, it must be insulated from the pole to prevent leakage. What is the wire supported by on top of the pole? (glass or ceramic insulators) Why use glass? (electricity does not go through it) (Experiments can be done in the classroom to see what things electricity does pass through and what does not conduct it.) Notice how wires are covered by heavy protective sleeves of rubber or other material as they cross each other or through the branches of trees.

   What about the large black cans? These are transformers. Have the children look the word up. It means to change. What would be changed from this pole? (electricity) Why? (Large amounts coming into the transformer changed to safer voltage for the house.) Do you plug in all the electrical things in the house? (No, some are put in by installers.) Could you plug in a stove to a wall plug? (No, it takes more voltage than the wall plug has.) Sometimes two kinds of voltage will be brought in. Near a school there will be more heavy lines going in because of the heavy equipment being used--110, 115 or 220. Does it flow in a steady flow into the house? (Not always) Do the fuse boxes help to maintain a steady flow? Why does a fuse burn out? A fuse is a protection if you plug too many things into one line. If it would be dangerous for the line to carry that much electricity, the fuse will refuse to carry it and burn out. That is why it is not safe to put a "penny in" to keep the electricity coming as a wire could start a fire.

Is there a ground wire running down the pole? Is there one on every pole? (No, usually only on those with transformers. This makes sure there is no leaking of electricity down the pole. However, they could be on every pole.) Why do the wires droop? Why don't they tighten them up? In the summer the wires will expand; in the winter they will contract; because of this the lines must allow for the change in the weather. Would the same droop be in the lines in Maine as in Florida? (No, a lineman has a book that tells him how much slack to allow in lines in different parts of the country.) What other things might an electric or telephone pole carry? (Street lights, fire alarm boxes, traffic signal boxes, police telephone boxes, air raid sirens, mail boxes, but no private signs

are allowed on them.) Is the distance the same between poles? Pace it off and see. It is different where there are poles with transformers? Why are some poles taller than others? (What the wires must go through) Are all lines on telephone poles? (More and more are being put underground because of looks, safety, and getting them out of the way.) An area must be checked for its "frost line" -- how deep the ground might freeze. Why? (Break the lines or pipes.) In Tennessee it is 18 inches. In Alaska, 6 feet.

A rubbing can be made of the markings on the pole for study back in the classroom.

A. Vacant Lots:

A vacant lot is not empty at all, but full of things which tell a story about the ever-changing earth and its resources. Valuable science learnings may be made if the owner of the lot will permit children to dig in the earth.

Features such as beaten paths, elevations and depressions, rocks, plants and animals may be studied in the following ways:

1. Find a path that has been made by the trampling of people's feet. Why did people select this path? Note that often no plants grow where the soil is trampled down, but that there may be plants in low spots where the soil has not been compacted.
2. Find a variety of commom wild plants which may be growing in the lot, such as: poison ivy (every child should be familiar with the appearance of this plant at all seasons), ragweed, dock, burdock, dandelion, English and common plantain, daisy, chickweed, Queen Ann's lace, butter-and-eggs, goldenrod, common reed, wild mustard, yarrow, clover, wild strawberry, Virginia creeper, etc. Note that each kind (species) has certain characteristics which help identify it.
3. Look for signs of erosion. Water may have washed topsoil from high spots to lower ones; gullies may show where running water carried this soil down the slope. Stones may stand on little pedestals of soil which they have protected from the force of raindrops while the bare earth next to them has been washed away. Tree roots may have been exposed as soil washed down a slope. On a breezy day, dry powdery soil may be compared to the dust storms out West.
4. Dig a hole with a spade to determine the depth of the topsoil. Use a hand lens to note that it is composed of mineral particles mixed with bits of plant and animal remains. Compare the topsoil with the subsoil, which consists largely of mineral particles. Have class find leaves and stems that are disintegrating to become part of the soil. Point out that it may take more than three hundred years for an inch of topsoil to form in our climate. Ensuing discussion on the importance of conserving the nation's topsoil is indicated here.
5. Note the size and variety of rocks and stones. Examine them to see if they are natural or man-made and if they were brought from some other place by man.
6. Turn over large stones to observe animals living under them. You may find pill bugs, snails, centipedes, ants, and other animals. Replace the stone before you leave. Point out that some animals are adapted to living in the conditions which exist under such stones.
7. Examine the trees in the lot. Is there evidence that any of them developed from seeds of nearby trees? Look for other young trees and shrubs that have grown from seeds that may have been dropped by birds or been blown by the wind. The ailanthus, "the tree that grows in Brooklyn," produces many seeds which are carried by the wind and germinate under a wide variety of conditions. This tree is often found growing in vacant lots.

8. If you find a stump or a tree that has been cut down, count the rings in the wood, to determine how many years the tree had been growing.
9. Observe the roots of a tree that was blown down. Note the mass of fibrous roots that aborbed moisture and minerals from the soil and the heavy roots which anchored the tree in the ground.
10. Examine old logs or pieces of wood that are being decomposed by fungi or insects. These fungi and insects are freeing the minerals in the wood, returning them to the soil in the everlasting cycle of nature.
11. Look for woodpecker holes, which may be found in dead trees.
12. Look for earthworm casts, little piles of earth left on the surface as the earthworm makes its tunnels. Earthworms are valuable soil-conditioners. They take plant material down into the earth, where it breaks up to help form soil. The tunnels of earthworms admit air and moisture to the soil.
13. Hold a "wild plant" show. Caution the children against poison ivy; allow them to pick a few flowers from other wild plants if the flowers are plentiful. Put them in water. All entries should be labelled. Emphasis should be placed on the variety in individual collections or on their attractive arrangement.
14. Assign a small group of children to a designated square yard of the lot. Have them report the plants, animals and earth forms they find in this limited area.
15. With the permission of the owner, dig up a cubic foot or less of soil, and place it in a box. Let the children spread it on a sheet of paper. Note that humus and mineral particles and examine the plants and animals that are living in the soil.
16. Again with the permission of the owner, dig out a block of soil. Take it back to the classroom and place it in an unused acquarium. Keep it moist, but not wet. A piece of glass laid over the top of it will prevent evaporation; if water condenses on the glass, allow a little air to enter by temporarily removing the glass or leaving an opening. Do not disturb this soil, but observe it daily for signs of animal and plant life.
17. Collect the seedheads of grasses growing in the lot and shake them over a piece of white paper, catching any mature seeds that may drop.
18. Look for signs of mammals: holes, burrows, or trails.
19. Notice any birds that may be feeding, resting, nesting, or singing.
20. Use an insect net to catch insects. Brush the tops of the grasses and weeds with a net, and in a few minutes you may have an astonishing variety of insects.
21. Examine any rocks that are breaking up.
22. When milkweed is being examined, point out that the juice is rubbery. It is latex and is similar to that which is tapped from rubber trees. The silk of the milkweed flower is sometimes used instead of kapok.
23. Make an autumn display of seed "packages". Let the children pick one each of any seedheads that are plentiful. Note which seeds catch on clothing and which may be scattered by the wind. Exhibit each specimen, and label with name, date and place it was found.

A nearby vacant lot can also be used as a Micro-Nature Center.

Questions:

Why use the outdoors as a lab? (see where the actual things are) Their relationship to each other. In a total picture and not just in pieces.

What can we have on the Nature Trail? (the area must be surveyed to see what is already there and what might be added)

If we use land not owned by the school what must we do to be able to use it? Find out owner and get permission to use it. Discuss insurance and how using the area would be like

children playing on the playground. The school wouldn't be responsible for anything that happened and neither would the owner of the property.

Could it be used year-round? (The nature trail would be interesting if reset up each lesson of the year with new stations and concepts)

B. If there is a vacant lot in the community or area where houses has been torn down, what about a Vest Pocket park? The Gov. Open Spaces Department has matching money for cities that want to put in small neighborhood parks. Many of these could be used in all areas. If land was available and the need for such a park showed itself it might be possible to start a campaign to get such a park established. Such a park should reflect what the community really wanted. Children should get involved in such a planning. Where it might just be a proposed "idea" with the proper planning and backing it might become a reality.

The children could discuss what they would like to see in such a park. Many times they would prefer to have other than the conventional playground equipment. Many new playgrounds in the East have "objects" (Time did a picture story on one that might be interesting to the children). Construction type blocks, climbing ropes and cargo nets. Railroad ties for balance beams, pipes for play, put together like animals, etc. The children can come up with lots of ideas. These can be drawn and developed into a master plan for a vest pocket park that might be of interest to the local Government.

Questions:

Why have Vest Pocket Parks? place to play, away from the streets, a bit of green left in the city.

Where could one be developed? Look over the area around the school to see if there would be a need and a possible area.

What would there be in such a park? Ask the children what they would like, and more from there.

Where would money to build such a park come from? Local sometimes community raises some state or Federal Government.

How does a community get the money from the Government? A plan has to be made up. Where the property is located. If private what the price would be, what would be needed on the land, How Big is it? Is there a need in the community for such a park?

The curriculum possibilities are endless in the activity Language Arts, letters to Mayor and councilman suggesting such a park. Making a propossel. Planning the park, talking to people in the community. Math: Size of area, possible cost of park including the price. What would fit into the area. Science: What plants and trees are already there? What should be planted to make the park more beautiful. Social Studies: How would the park benifit the community? What problems might there be? (Litter Vandlalism) How could they be overcome?

C. Beautifying the School Site

If the students work on the landscaping the school sites there is much better chance that the bushes, flowers and trees will not be torn down. If the children can feel a pride for the site and the things they plant.

Trees can be planted near an eroded slope or in an open area, shrubs around the building. Each class could have an area to plant and take care of. Trees can be bought at a very low price from the Department of Forestry.

This type of project also ties in well with the study of plants and soil. The soil could be

tested to see what type of plant would grow best in that area.

SECTION III

Here are some sample worksheets that can be used on the school site. There are many lessons that can be done by the teacher and children without any equipment or material. Walks to look at signs of fall or special habitat walks can be done as a group.

In order to have more of the children participate in the outdoor activities the use of small groups is recommended. These groups can have a leader who puts the collective answers on a sheet or each member of the group can have his own activity sheet to fill in. The activities may be in the form of a treasure hunt or in search of clues about a certain thing. Group or individual study can be made of two different types of communities on the site or different types of habitats.

Maps can be drawn of the school site and special things such as trees, interesting areas etc. can be drawn in in symbols.

A census can be taken of the types of trees on the site and estimations made of the value of the trees.

Shapes and sizes on the site can be compared and measured. Micro-climates can be found and compared for types of plants and animals. Clue sheets can be made up for learning trees or birds.

The sample work sheets that are given here are merely examples of some that can be made by either the children or the teacher for a more involved experience on the school site.

The work sheets should be explained in the classroom and then the total class can try one before the group divides up in smaller units for the activity.

BUD WATCHING SPRING

In the late fall or winter there are no leaves on the deciduous trees. The buds are on the tree waiting for the spring.

1. Find a bud on a limb- - - If it is at the end of the stem it is called a TERMINAL bud. If it is on the sides of the branch it is a LATERAL bud- - - Decide on one bud to study and tie a piece of colored yarn on it so you will be able to find it again. Is your bud terminal or lateral?_____

2. Draw a sketch of the bud_____

3. When spring comes the bud will swell- - - The terminal bud at the top of the stem produces growth of the stem, the end or terminal bud at the end of the branch makes the branch grow longer and the lateral buds make new twigs that will grow into longer branches. Which thing will your bud do?_____

4. Some buds may be flower buds- - - These may open before the leaves come; do you see any of these buds on your limb?_____

5. Look along the stem- - - Notice the scar, this is where the terminal bud opened. Count the number of scars (they go around the stem or twig) on the branch. How many are there?_____ This count will tell you how old the branch is, as each branch makes one terminal bud a year- - - Follow it to the trunk. Is this limb as old as you are?_____

6. Is the length the same between the bud scars?_____ Why?_____

7. If the leaves are out you will notice that new buds are being made for growth next spring. (Do you find these buds?)_____

8. Look at the pictures on the bud clue page- - - See if you can find out the name of your tree by looking at the buds. Name_____

9. Find the leaf scars on your branch. How many do you find?_____

MICROCLIMATES (LITTLE CLIMATES)

Even on a school site there are many different temperatures. The differences might be as much in this one area as between two states such as Maine or Arizona. The Little or micro-climate is the layer of air near the ground. Even here the difference in wind speed, temperature, humidity and moisture may be as great as changes all over the country. This difference will affect what animals and plants live there.

Pick several different areas on the school site- - - Pick several in the sunlight and several in the shade- - - Measure the air temperature 1 inch above the surface (allow five minutes for each reading)- - -

	grass	bare dirt	concrete	asphalt
Sunlight temp.				
shade temp.				

Why do you think the temperatures will be different?_____ Put a white sheet of paper under the thermometer on the asphalt in the sun and take another reading. Is it the same as before?_____ Why?_____

Take two cans, take the paper off of one so it is shiny. Paint the other black- - -Fill both with water. Put them into the sun for 1/2 hour. Which has the highest temperature?_____ What made it be higher_____. Why would the grassy area be cooler then the concrete or asphalt?_____ What is in the soil that keeps that area cooler?_____ Find an area on the school site about a yard square- - - Take several readings. Are they the same?_____ Why not?_____ Dig down into the ground and take a reading. Is there a difference?_____

Questions on "Your Tree"

Put answers in your tree booklet.

1. Draw the shape of the tree.

2. Select a leaf.

3. Draw whether the branches are opposite or alternating - Draw.

4. List any damage to the tree and draw:
   holes
   small tunnels
   eaten leaves
   broken branches
   fungus plants (looks like shelves, pieces of white bread, hard mass on branches)
   aphids (tiny green insects on leaves)
   lichens (flat plants on trunk, green or gray)

5. Any companions around?
   tracks
   nests
   homes in holes
   webs
   woodpecker holes
   caterpillars
   ants
   butterflies, moths
   other insects
   birds
   squirrel

6. Draw a map of where your tree is located:
   size of tree
   height of tree
   diameter
   number of board feet
   bark color

7. Take a sample of soil:
   a. surface
   b. six inches below surface
   c. several feet away from tree
      Test the samples; keep for booklet.

8. Check your tree later in the year and add any new things you may see.

INSECT WORK SHEET

1. Would you expect to find many insects on the school site? Why? _____

_____

2. Examine an insect closely with your hand lens. How many parts was its body divided into?

   One_____ Two_____ Three_____ Four_____

3. From which part of the body did the legs come?

   first part_____ second part_____ third part_____

4. How did your insect move?

   fly_____ crawl_____ eat_____ swim_____

5. What color was the insect you observed?

   black_____ green_____ red_____ multicolored_____

6. What purpose does the color of an insect have?

   look pretty_____ easily seen_____ protection from enemies_____

7. What soil dwelling insects did you discover?

   _____ _____ _____

8. Where did you find the most insects?

   leaf litter_____ tree trunks_____ leaves of trees_____ soil_____

9. Try to find a ground spider. Look on the tree and near rocks. What is the difference between it and the insects. Use hand lens.

   Differences _____

   _____

   _____

10. Which of the insects you found are beneficial? Which are harmful? Why? _____

_____

11. Look for insect homes. What kind of home did your insect have? Note: Look under leaves, on tree trunks, under the soil, on flowers, almost anywhere. _____

12. Examine the head of your insect closely. What do you think it would eat for food? _____

13. Name an animal that eats insects for its food. _____

Follow-Up Activities

1. Make an insect collection.
2. Use a magnifying glass or microscope to inspect thin sections of an insect's mouth parts, compound or simple eyes, legs, feet, wings, and part of the abdomen showing spiracle.
3. Try to observe noise-making insects such as a cricket, katydid, cicada, or locust to find how it produces the sound. In what season is each one commonly heard?

Section III
Work Sheet

Language Arts

Look around you, there are many things to be seen. List as many words as you can find that begin with the letters of the alphabet listed below. In the second list put in all the words you can find that end with the listed letter.

1. b _____

c or ch _____

t _____

h _____

m _____

r _____

s _____

n _____

w _____

p _____

g _____

l _____

a _____

i _____

2. t _____

n _____

e _____

r _____

s _____

h _____

m _____

b _____

g _____

w _____

p _____

k _____

f _____

d _____

Try to write a sentence using at least four of the above words.

Section III

Language Arts

Use your senses out here on the school site. Below are some words. Under each kind of sense list all of the words you can find that would help to describe an object in the out-of-doors. Use your senses to discover more words.

examples:

Hear	See	Feel	Smell
loud	bright	smooth	sweet

Section III

Social Studies

Litter is one of the worst problems we now face. The manufactors make so many things and most of the packages are thrown away. We have so much that we often do not think about throwing things away. Below is a list of some litter that might be found on your school yard. Divide in groups. Take a litter bag. Have one person as a recorder. As you pick up the litter record it on the check sheet. The second list is of problems that you might have on your school site. Check any you see, then, as a group, try to figure out how you and the other classes might correct the problem.

Litter	
broken glass	____
cans	____
paper	____
plastic materials	____
bottles	____
bottle or can tops	____
crayons or parts of pencils	____
rubber bands	____
pieces of cloth	____
pieces of medal	____
milk cartons	____
garbage	____
pieces of old toys	____
any others	____
Name	____
	____
	____
	____
	____

School Site Problems - What to do	
low wet places	____
soil erosion	____
no grass cover	____
overflowing trash	____
cracked sidewalks	____
holes in street	____
broken street lights	____
peeling paint	____
old odors	____
car or bike ruts	____
gravel getting on grass	____
broken windows	____
no trees	____
others	____

Section III

Census

Many of you may have heard of the "people" census that the government takes every 10 years. On the school yard there are many living things. There are also many things that man has put on the school site. Below is a check list. Take a walk around your school yard and check off all the things you see.

Plants or Animals					
ant or ant hill	____	dandelion	____	flagpole	____
squirrel nest	____	clover	____	fence	____
wasp nests	____	wild strawberry	____	telephone pole	____
holes in ground made by insect	____	sour grass	____	sidewalk	____
bird nest	____	moss	____	parking lot	____
bird	____	shrub	____	play area	____
animal print	____	vine	____	trash cans	____
half eaten leaf	____	yellow weed	____	fire plug	____
spider	____	lichen	____	stop signs	____
earthworm	____	gall	____	bicycle rack	____
grasshopper	____	evergreen	____	gutter	____
bee	____	broadleaf tree	____	light meter	____
insects on bark of tree	____	mushroom	____	transformer	____
pill bug	____	tree fruit	____	cement area	____

Which animal do you think is the most numorous on the site?_____

Which plant has the greatest number?_____ Why does this plant grow so well on the school site?

Which of the man made items are pretty?____ Which are ugly?_____ Could the ugly ones be made better looking?_____ How?_____.

Section III

Science

Trees

Look around the school yard. You will find many different kinds of trees. Answer the questions below about all of the trees. Then select one tree that you want to "adopt". Answer the questions on the tree sheet about this one tree. There are several activities that you can do with the first tree survey.

a. Take a "fingerprint" for each different kind of tree. This can be done two ways. Use a piece of paper and a crayon. Hold the paper over the bark of the tree and rub with the crayon. The texture of the bark will show on the paper. Another way to take a "fingerprint" is to press the plasticine clay against the bark. The rough bark will leave an imprint in the clay.

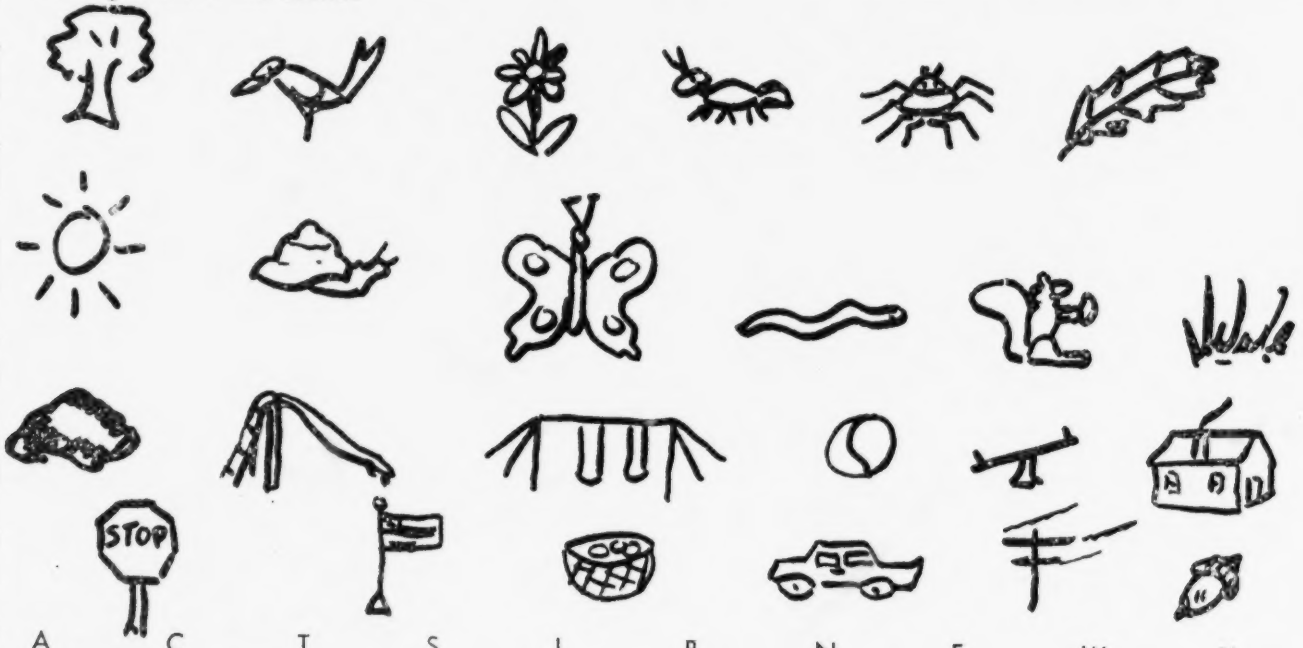
Answers these questions:

1. How many trees are there on your school site?_____
2. How many DIFFERENT kinds of trees?_____
3. How many are deciduous?_____ How many evergreen?_____
4. Pick out the smallest tree, use a tape measure and measure the circumference about three feel above the ground._____
5. Pick out the largest tree and measure its circumference._____
6. Are these trees of the same kind?_____ Is one evergreen?_____
7. How do you think these trees got to be where they are standing?_____
8. How many of the trees have "pretty" flowers?_____
9. Name as many "fruits" of the trees as you can._____
10. How does each kind of tree help birds and animals?_____

Section III

Language Arts Primary

Here are some pictures of things you can see out here on the school yard. Below the pictures are some letters. Look around you. Sound out the words that name the pictures. Draw the picture under the right letter and sound.



A	C	T	S	L	B	N	E	W	H

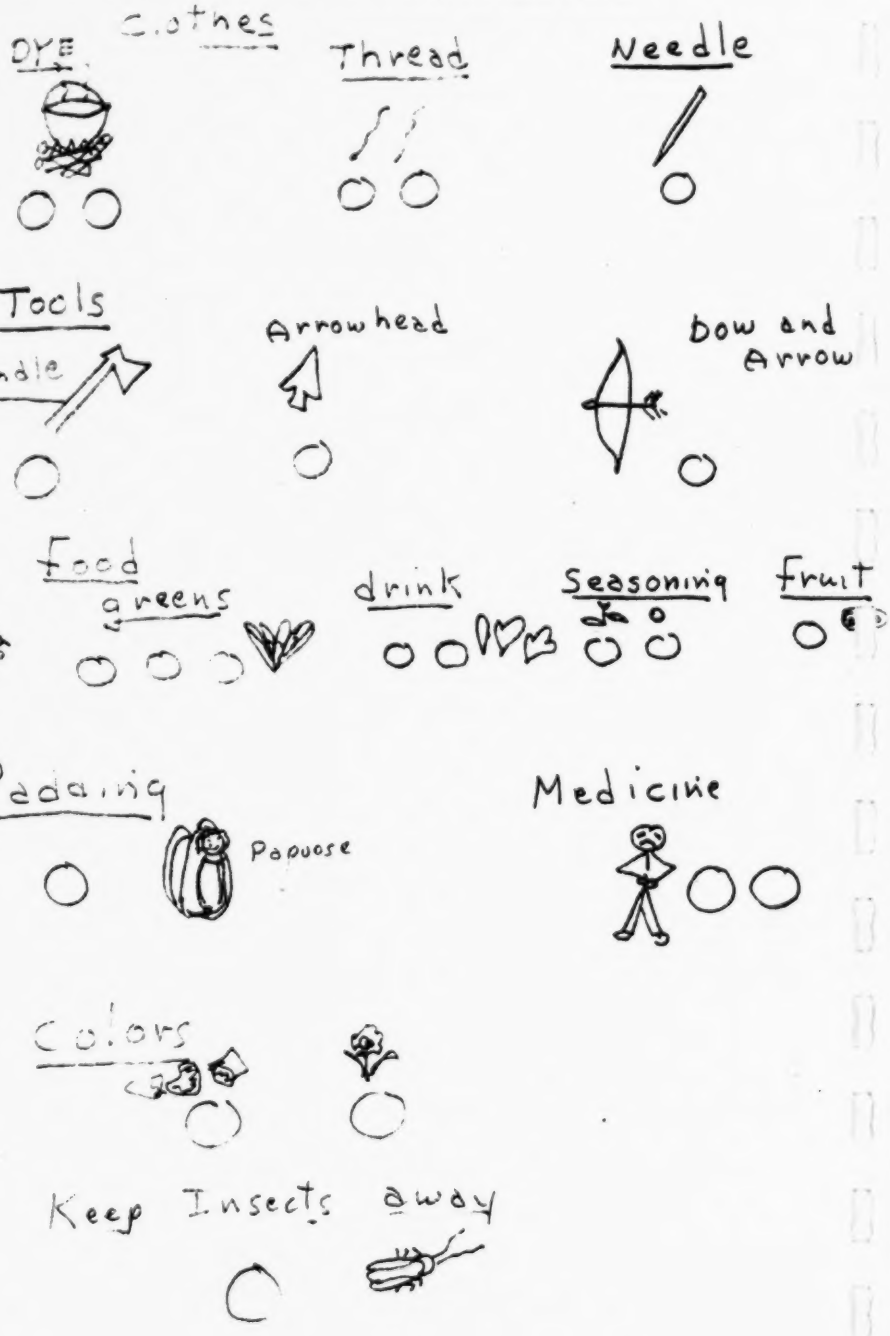
Section III
Work Sheet

Social Studies

Your school stands where pioneers and Indians might have lived. If you had been a pioneer or Indian what material might you find, on your school site, that you could have used to help you in food, shelter, clothes, tools, medicine and colors? Below are a list of possible pioneer and Indian needs. Go around your school site, there are many signs posted on the trees. Read them, put the number of the right answer in the circle under each picture. Some may be used twice.

Answers

1. Poke
2. Sassafras
3. Blackberries
4. Dandelion
5. Hackberry
6. Honeysuckle
7. Hickory
8. Mock Orange
9. Maple bark
10. Leaf of Dock
11. Inner bark
12. Locust thorn
13. Chert
14. Soft chert
15. Flowers
16. Milk weed and thistle
17. Sour grass
18. Lamb quarters



Social Studies Worksheets

The following are suggested signs to be used on the school site in connection with how the Indians and pioneers used the land.

1. This is an Osage or Mock Orange Tree. Notice the orange inner bark. The bark was used by the pioneers and Indians to make dye for their clothes. This tree, named after the Osage Indians, was used to make bows and arrows. Today the wood is used to make policeman's clubs. The "fruits" of this tree is a large yellow green "orange." It is often called "milkball." Some animals will eat it but it cannot be eaten by humans. One use for this Osage Orange is to cut it in half and put it in a corner of the kitchen or other rooms. It will kill roaches and other bugs.

2. This French plant, the dandelion, was used by the pioneers in many ways. The early green leaves are good to eat, the roots can be used as a medicine. The flower part can be used two ways- fried and eaten or made into a wine. Another plant used for its greens is poke. The early spring leaves are good cooked but only if they have been washed many times. The rest of the plant, stalk, berries and roots are poisonous.

3. This is a sassafrass tree. Indians and pioneers made a tea from its roots. The twigs were chewed and made into a toothbrush. Food could be wrapped in its leaves to give a good flavor in cooking. Today the tea is still used and the flavoring used in making many kinds of root beer. Flavor for medicine also comes from this tree.

4. The hackberries on this tree were used as survival food by the Indians. The pioneers and Indians also ground up these berries to make a seasoning for their meat.

5. Blackberries were eaten as food, used in baking and taken on trips. Other food used for seasoning is the sour grass, or pickle weed. Both the leaves and the pickles (seed pods) were used to season foods.

6. Ash and hickory trees were the best wood for tools. The wood of these trees will absorb the shock of a blow. That's why baseball bats are usually made of ash. Hickory was also used for smoking meats. It makes the best coals for slow cooking. Hickory and ash are also excellent woods for construction. Hickory juice is also very sweet and can be used instead of sugar.

7. This brown rock is CHERT. Flint is a form of chert and this type of rock can be chipped to make weapons. The Indians used this type of rock to make arrow heads and spear heads as well as tools. They would trade for the better grade flint but would use chert when they could not get the flint.

8. Many Indian babies (paposes) were carried on their mother's backs. The "cradle board" had to have both padding and some form of diaper. The Indians packed the silk from milkweed and thistle seeds in around the baby.

9. The bark of many trees was twisted to make cord. The leaves of plants were stripped and twisted for string. A thorn from a locust tree was the needle. The bark of the maple tree also gave a light blue dye. The hickory bark gave a light yellow dye.

10. Lambs quarters, a weed often found on school sites, is a very good green. The tiny pea pods from the sweet pea can also be eaten.

Birds Activity

1. Concepts to develop
   A. Birds have certain characteristics that enable them to adapt to their environment.
   B. Birds depend on materials from their environment for survival.
   C. Birds are dependent on other animals. They interact to benefit one another.

2. Vocabulary Development
   1. Habitat
   2. Environment
   3. Plumage
   4. Bill
   5. Beak
   6. Migration
   7. Incubation
   8. Down Feathers
   9. Feeder
   10. Birdcall

3. Procedure
   1. Select a spot on the school site to observe birds.
   2. Watch a bird in flight. Are the wings moving up and down or do they move forward and downward? _____ and _____
   3. Compare the size of the bird to that of a crow, house sparrow or robin. _____
   4. Some birds live in the tree tops (canopy), some live just under the canopy (overstory), some live near the mid-zone (understory), some live near the ground (shrub), and some live on the ground. What do you think the birds living in these areas would use for food? _____
   5. A birds home is called its habitat. The kind of nest he has depends upon how it is going to be used. Song birds babies are very weak when they hatch out of their eggs. They have no feathers, their eyes are closed, and they have to be fed and kept warm by their parents. Therefore, a nest is built. Look carefully for an abandoned birds nest. Notice how it is constructed. What is it made of? Is it large or small? Where is it located? _____
   6. A birds most important nest-building tool is its bill. Many birds have different bills depending on where they live and what they use for food. Notice the bills of the birds you observe. Describe them. _____
   7. Birds have different songs and calls. Birds sing mainly during the breeding season, but they call all year round. Birds use their voices for warning other birds to keep away from their territories, for attracting their mates, and for sounding danger signals. A chicken calls its family together by clucking. Geese constantly chatter together while flying on migration in great V formations. Listen to the birds you observe, are they singing, calling or fussing at you for invading their area?
   8. Birds stage one of the greatest shows every autumn and spring, when billows of birds make their way between their winter and summer homes. This is called migration. Although ornithologists (people who study birds) have spent years trying to solve the mystery of why and how birds migrate, this is still a puzzle.

      Observe some birds on your school site, near and around your home during the spring. Keep a record of when these birds are seen. (What season?)

   9. Use the following charts to help you in your bird study and activities.

Some

The History of Measures (TAPE)

Some relations man discovered between measures:

4 fingers = 1 palm	2 ells or 2 girths = 1 fathom
3 palms = 1 span	3 feet = 1 ell
2 spans = 1 cubit	5 feet = 1 pace
2 cubits = 1 ell or girth	6 feet = 1 fathom

CAN YOU COMPLETE THESE?

1. Abraham Lincoln once said, "Fourscore and seven years ago..." How long is fourscore and seven years?

   (a) 21 (b) 27 (c) 47 (d) 87

2. In the poem, "The Charge of the Light Brigade," we read: "Half a league, half a league, half a league onward." How far is half a league?

   (a) 100 yards (b) 1 1/2 miles (c) 3 miles (d) 1/2 mile

3. When someone asked George Washington how long he expected to be in Washington, he replied, "About a fortnight." How long is a fortnight?

   (a) 4 days (b) 4 months (c) 2 weeks (d) 20 days

4. In Shakespeare's play, The Tempest, we read, "Full fathoms five thy father lies." How deep is a fathom?

   (a) 18 inches (b) 3 feet (c) 6 feet (d) 25 feet

5. The dimensions of Noah's Ark can be found in the fifteenth verse of the seventh chapter of Genesis: "The length of the ark shall be 300 cubits, the breadth of it 50 cubits, and the height of it 30 cubits." How long is a cubit?

   (a) about 18 inches (b) 15 feet (c) 6 inches (d) 3 feet

6. At the annual Kentucky Derby, horses are raced on a track 10 furlongs in length. How long is a furlong?

   (a) 1 mile (b) 100 yards (c) 220 yards (d) 1000 yards

Look up the words-- fourscore, league, fortnight, fathom, cubit, and furlong-- in your dictionary. How many did you have right in the test?

CHILDREN'S WORK SHEET (BIRDS)

I. Take a walk around the center. Do you see any birds? How many kinds do you see? Put a mark (X) in front of the number.

___ one ___ two ___ three ___ four ___ more than four

II. Check the names of the birds you see, if you know them.

___ Pigeon ___ Starling ___ Sparrow ___ Bluejay

___ Robin ___ Crow ___ Redwing Blackbird

III. Put a check mark (X) to show how the birds are not alike.

___ size ___ color ___ bills ___ tails ___ feet

___ wings ___ where they rest ___ how they fly

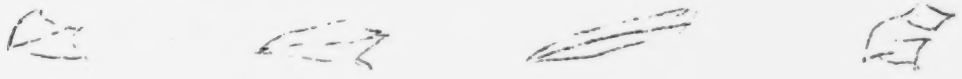
IV. Study one bird closely. Write its name, if you know it.

_____

V. Circle the size that is most like your bird.

smaller than a robin same as a robin bigger than a robin

VI. Circle the bill that looks most like your bird's bill.

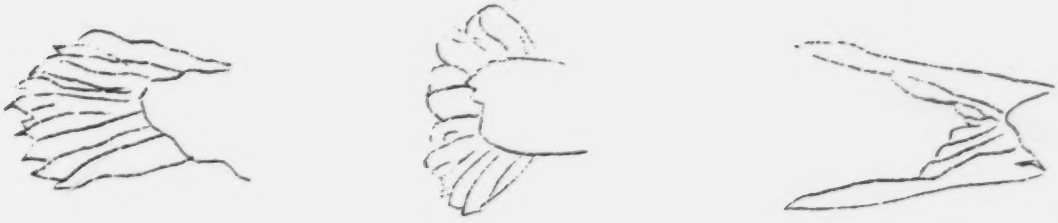


VII. Circle the feet that look most like your bird's feet.

VIII. Circle the wing that looks most like your bird's wings.

CHILDREN'S WORK SHEET (BIRDS)

IX. Circle the tail that looks most like your bird's tail.



X. Circle the words that tell how your bird flies.

___ in a straight line ___ like a roller coaster ___ soars

XI. What color (or colors) is your bird?

___ black ___ blue ___ gray ___ white ___ red ___ brown

___ purple

XII. If your bird was eating, what was he eating?

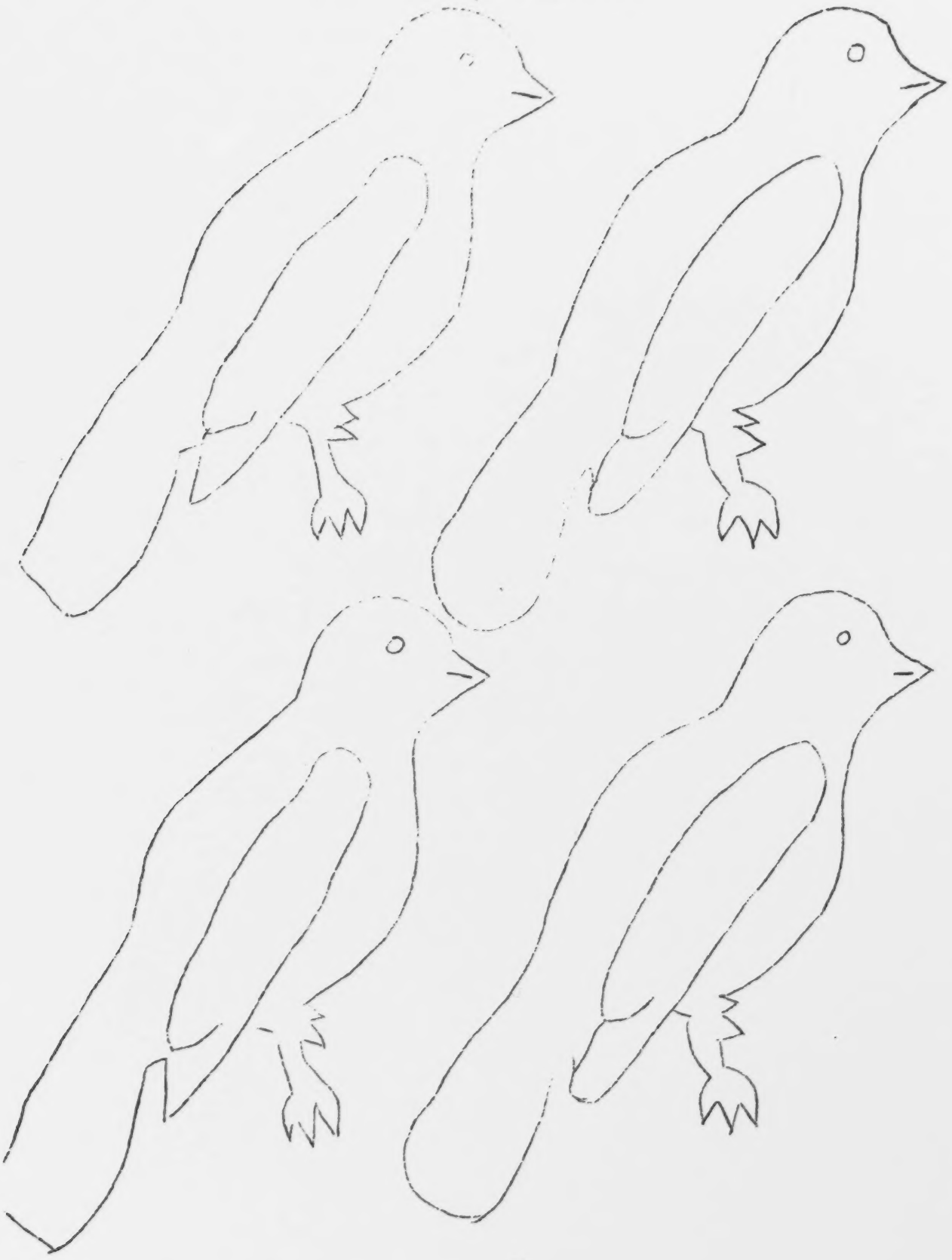
___ food scraps ___ seeds ___ insects ___ worms

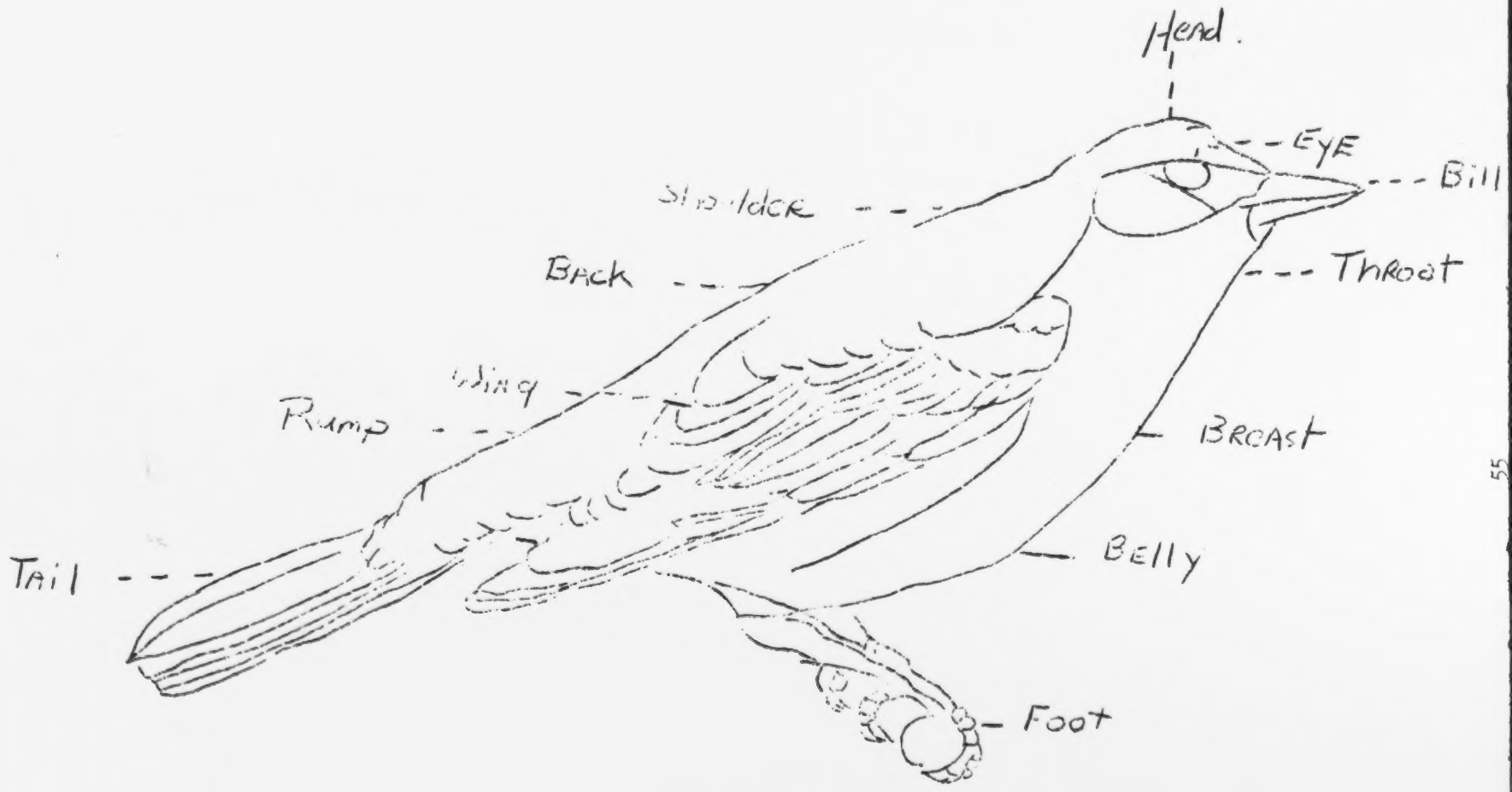
XIII. Circle the times of the year you have seen this bird in your neighborhood.

winter spring summer fall

XIV. What part or parts of your bird helps it most in getting the things it needs to live?

CHART FOR LABELING BIRDS SEEN




Head
Eye
Bill
Shoulder
Throat
Back
Wing
Rump
Breast
Tail
Belly
Foot

OBSERVING BIRDS IN THE WOODS

DATE _____ WEATHER _____

Names and numbers of birds and/or nests seen in the layers of the forest.

overhead

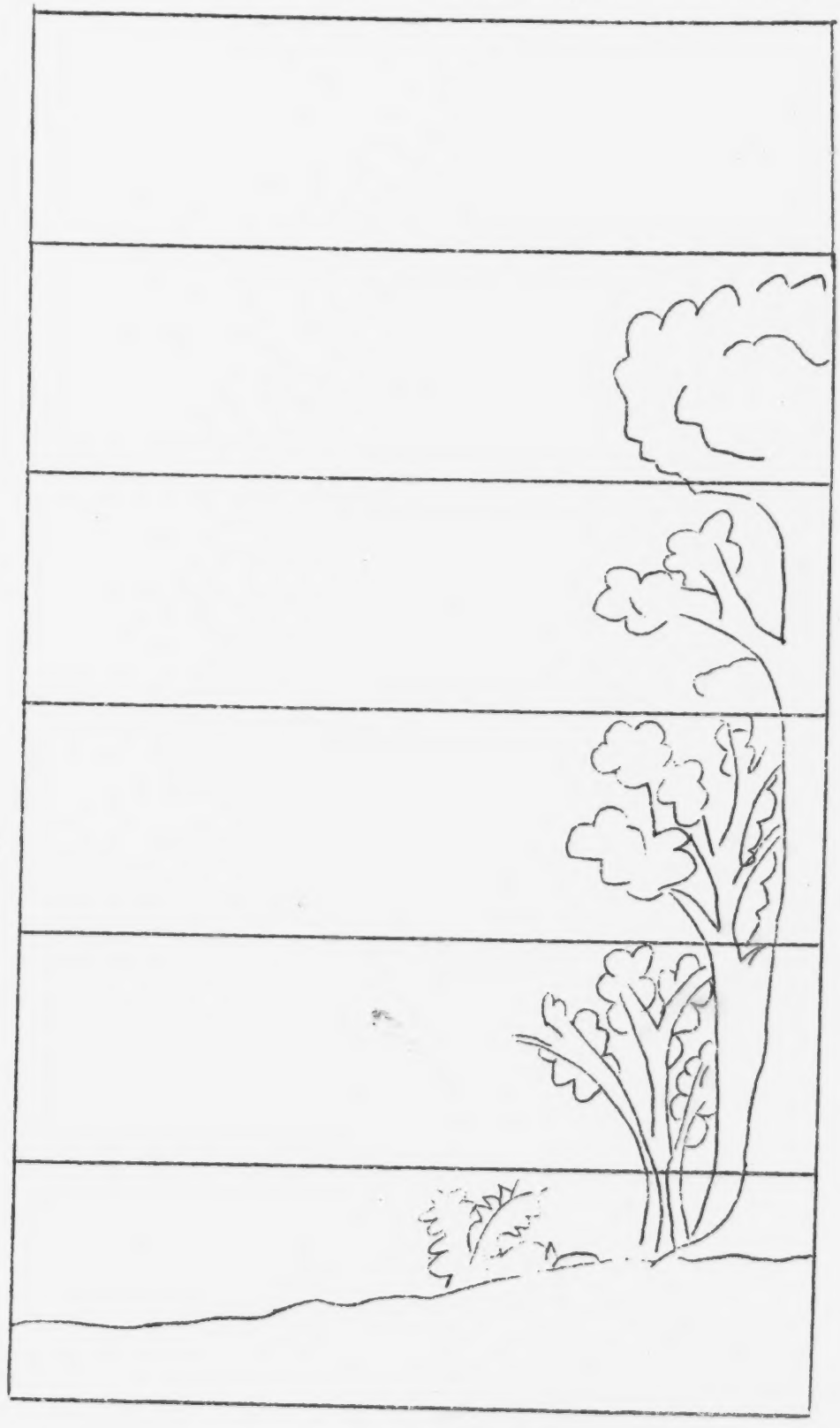
canopy

overstudy

understory

shrub

harbaceous



USEFUL MEASURES

A. PERSONAL EQUIPMENT:

1. HAND:

a. HAND OPEN _____ INCHES.

b. LENGTH OF INDEX FINGER _____ INCHES.

c. FIRST JOINT OF THUMB _____ INCHES.

d. HAND LENGTH _____ INCHES.

e. HAND WIDTH _____ INCHES.

2. ARM:

a. FROM INDEX FINGER TO ELBOW _____ INCHES.

b. FROM ARMPIT TO FINGER TIP _____ INCHES.

c. NOSE TO FINGER TIP _____ INCHES.

d. REACH IN HEIGHT _____ INCHES.

3. LEGS:

a. MY PACE IS _____.

b. MY STRIDE IS _____.

c. MY FOOT MEASURE IS _____ INCHES.

d. KNEE TO THE FLOOR IS _____ INCHES.

4. MY HEIGHT IS _____ FEET _____ INCHES.

5. WEIGHT IS _____ _____ LBS.

B. DISTANCES COMMONLY KNOWN

1. BASEBALL FIELD - HOMEPLATE TO FIRST BASE --- 90 FEET.

2. BASKETBALL FOUL LINE TO BELOW BASKET --- 9 FEET.

3. AUTO TRACKS ARE ABOUT 4 FEET 4 INCHES APART.

4. DESK IS 30 INCHES HIGH.

5. THE BASKET IS 10 FEET FROM THE FLOOR.

6. TENNIS COURT IS 36 BY 78 FEET.

7. FOOTBALL FIELD IS 160 BY 300 FEET.

8. ONE ACRE IS APPROXIMATELY 200 FEET SQUARE.

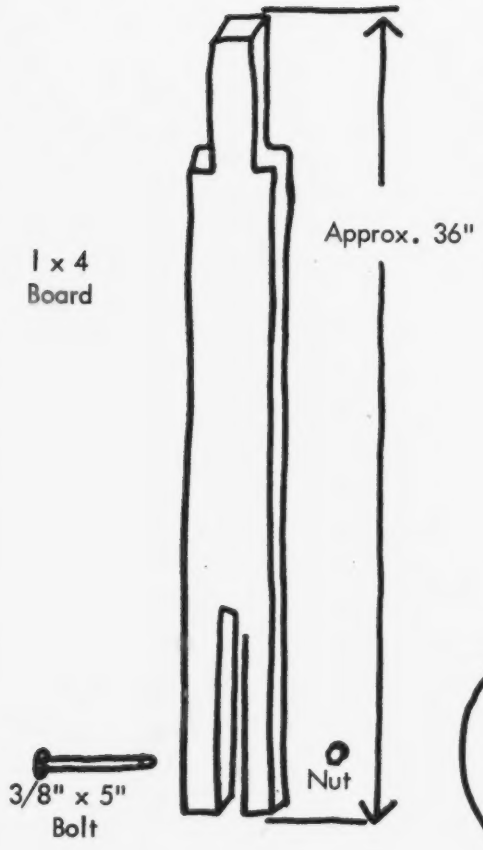
DIFFERENCES IN ANIMAL HABITATS ON SCHOOL SITE 4-5-6

TYPE OF HABITAT	TEMP. OF AIR	TEMP. OF SOIL	AMOUNT OF MOISTURE	EXPOSURE SUNNY - SHADE COOL WARM	AMOUNT OF FOOD SHELTER	PROTECTION FROM MAN & OTHER ENEMIES	WHAT FORMS WERE FOUND

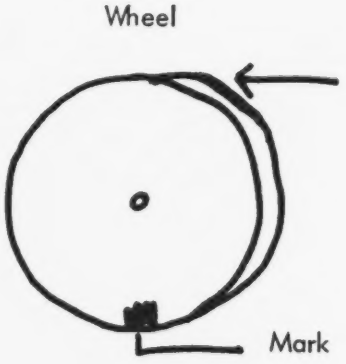
1. Which area did more animals prefer?
2. How do the various kinds of plants and animals depend on each other?
3. How could living conditions for animals be improved with little expense?

A "LIB ROLLER"

To use as a measuring device out-of-doors



Wheel size depends on how large an area you wish to measure at one time. Correct size should be one of the problems figured out by the children.



LIB ROLLER
Scale 1/8" = 1"

Everytime the wheel goes around (red mark shows on top) a certain distance is traveled - 3 feet is a good size - diameter of wheel determines the distance the wheel travels.

The following sheets are adapted from a publication by the U.S. Department of the Interior "All Around You" - an environmental study guide- The complete manual can be obtained from the Superintendent of Documents - U.S. Gov. printing office - Washington, D.C. 20402 — Price $1.50 — Stock No. 2411-0035

The following Sheets are adapted from a publication by the U.S. Department of the Interior "All Around You" — an environmental Study guide— the complete manual can be obtained from the superintendent of documents — U.S. Gov. printing Office Washington D.C. 20402 Price $1.50 — Stock No. 2411-0035

Teacher's Page

Colors, smells, and sounds are an exciting part of anyone's environment. They add a great deal of enjoyment to our lives if we remember often to notice them. They tell us what season it is, whether other living beings are far away or nearby, and what the condition of our environment is.

Can you imagine a world without colors? Without smells? Without sounds? In that kind of world, the thoughts and ideas you could conceive and express would be severely limited. Our ways of communicating with other people would be markedly reduced.

Colors, sounds, and smells seem to have very definite effects on the way we feel, and even on the way we act. Each individual uses colors, odors, and sounds to identify other people and to develop his own self-image.

Colors, smells, and sounds in Nature offer great diversity and beauty in what might otherwise be a very dull scene, and many of them can not be reproduced by Man. On the other hand, think of the unique colors and sounds man has produced through technology, and especially through music, the visual arts, and literature. There are even some man-made odors we really like, such as fresh-perked coffee, or home-baked bread!

YOUR ENVIRONMENT IS ALL AROUND YOU!

The exploration of your environment will begin here, wherever you are right now, which is probably in the classroom. To explore, use your senses!

SEEING
FEELING
SMELLING
HEARING
TASTING

These are the tools you will use; they are all you need.

If you are like most people, your senses may need a little tuning up. Today in our machine-age cities, people rely less and less on their senses and more and more on machines for information about the world around them. They can go through life looking without ever seeing, touching without ever feeling, and listening without ever hearing. It is an easy, but dull existence.

Developing greater sensitivity can be fun. By using your senses to their fullest, you will become more aware of both yourself and your surroundings -- in other words, of your environment.

Start with the big blob of things you can see out the classroom window. Everything in the world is different and everything means something different to every person. Differences can be in color, texture, shape, smell or any other quality. Even though things are different there still are many ways in which they are alike.

What sort of things do you see out the window? Take some time and don't just look; try to really SEE!

Things I see:

You have used your eyes to notice some things outside the window. This is only a beginning. Your eyes can tell you more than just what objects are present. They can show you how things are alike, different, and how they are related. Let's investigate some of these relationships.

Are some of these things alike in some way? How are they alike? For example, are they the same color? size? texture?

Teacher's Page

Our environment is a constantly changing dynamic system. Like the movement of a clock's hour hand, change may be imperceptible, but it is constantly occurring. Buildings are crumbling, mountains are being born, and people are growing older. Any interaction between two members or factors in the environment produces a change—even if you and I are not here long enough to see it happen.

If you take a leisurely walk in your neighborhood or another neighborhood in town, you will see many changes taking place. Some are for the better; they improve people's lives. Other changes are the result of man's neglect or misuse of resources. To accomplish change, people must pool their efforts and, in some cases, their funds.

In a world that is changing so rapidly, we need a better understanding of the kinds of change that will benefit man. Because the needs and interests of individuals vary, they will not always agree that specific changes should be made. But if the conditions and changes which make for a healthy, balanced environment can be identified, these should become our common goal. Scientists must investigate some of these changes. However, we can use our own common sense to recognize basic changes needed, such as cleaner water. We can express our personal preferences concerning the kind of community that we think would be healthy and pleasant to live in. Working together, we can bring about many important changes ourselves.

In what other ways might these things be alike? Think about what they do in your environment. What is their function?

In what ways are the things you have listed different?

Are any of these things changing in any way? If they are, how? What is causing these changes?

What is changing?	How is it changing?	Cause of change?

Are there any objects on your list that look as though they aren't changing? If there are, how do you think they will look in 10 years? 100 years? 1,000 years?

Objects	10 years	100 years	1,000 years

From your list pick out your favorite thing . . .

Use one word to name what it is.
Can you use two words to describe it?
Three words about what it is doing?
Four words to describe how you feel about it?
One word which, to you, means the same as the first word?

For Example:

walls

big small

fences stop dividers

keeps one from another

tall*

Your Favorite Thing:

_____

_____ _____

_____ _____ _____

_____ _____ _____ _____

_____

You just wrote a poem called cinquain (sin-kane) about your favorite thing which you saw from the window.

Is there anything you saw from the window which you didn't like? What are some of the things you didn't like? Why not?

Write a cinquain about a thing you saw which you did not like. Compare it to the first cinquain you wrote.

_____

_____ _____

_____ _____ _____

_____ _____ _____ _____ _____

_____

* adapted from a cinquain by Mary: Charline McDonald; "A Place I Like," Washington Education, Washington Education Association, March 1970

If you could change some of the things you saw which you didn't like very well, what would you do to them and how would you go about doing it? Would your changes result in other changes or side effects?

Changes I Would Make	Possible Side Effects

When we try to pick out anything by itself, we find it hitched to everything else in the universe.

–John Muir

Colors

Like acrobats on a high trapeze
The Colors pose and bend their knees,
Twist and turn and leap and blend
Into shapes and feelings without end.*

Notice the colors of the things on your list which you didn't like very well. Compare these to the colors of the things you did like. Is there any difference? If so, what is the difference?

What is your favorite color? _____ . How does that color feel? How does it taste? How does it smell? How does it sound?

feel _____
taste _____
smell _____
sound _____

List the things you observed from the window which are your favorite color.

Things My Favorite Color:

1.
2.
3.
4.
5.

Let's go outside and take a closer look at what you have been observing and thinking about!

Take a good look at the natural objects around you. What colors are present in the natural objects you can see?

Natural Objects	Colors Present
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.

*From HAILSTONE AND HALIBUT BONES, by Mary O'Neill. Copyright © 1961 by Mary Le Duc O'Neill. Reprinted by permission of Doubleday and Company, Inc.

Compare these colors to the colors of the man-made objects, including clothing, you see. Where is the greatest variety found, in Man or Nature?

Where is your favorite color found most often, in man-made objects or in natural objects?_____ . What purpose does the color serve in these objects?

What colors are the animals and birds that you see or have seen? What do these colors do for the animal or birds? Can you think of how colors help animals or birds survive?

Animal/Birds	Color	What the color does

Notice the advertising around you. What colors are present?

What role do colors play in advertising? For example, is a colored sign more interesting than one which is black and white?

Do colors affect and change you and your behavior? How? For example, think about how you would feel in an all-black room. What do colors have to do with your choice of clothing?

The Colors live
Between black and white
In a land that we
Know best by sight

But knowing best
Isn't everything,
For colors dance
And colors sing,
And colors laugh
And colors cry –
Turn off the light
And colors die,

And they make you feel
Every feeling there is
From the grumpiest grump
To the fizziest fizz.

449-291 O - 72 - 2

And you and you and I
Know well
Each has a taste
And each has a smell
And each has a wonderful
Story to tell. *

*From HAILSTONES AND HALIBUT BONES, by Mary O'Neill. Copyright © 1961 by Mary Le Duc O'Neill. Reprinted by permission of Doubleday and Company, Inc.

Smells

We have a habit of not using our senses to their capacity. The sense of smell is one we probably ignore the most. This is unfortunate since smells can tell you a lot about your surroundings.

Stop for a minute and use only your nose. Breathe deeply and take notice of everything your nose senses. List the different smells you can pick out. Where do they come from?

Smells	Where they come from

Are some smells more pleasant than others? _____. Which ones are they? Why do you like them better?

How often do you rely on your sense of smell? Think about what your sense of smell does for you in your everyday life. Give some examples of how you use your sense of smell.

Examples:

Would it be possible to develop your sense of smell so that it could do more for you? If you think it would be, how would you do it?

Imagine that you are living in a forested area in North America about 400 years ago and that for your survival you depend on deer hunting. How important a role would your sense of smell play in your survival? Why?

Does this tell you anything about why your sense of smell isn't very acute? What?

Describe how it smells outside when the first rain is just beginning to fall after a dry period. Use a cinquain, sketch, story or anything else to make this description.

Sounds

The sound of black is
"Boom! Boom! Boom!"
Echoing in
An empty room. *

Sounds are an exciting way to learn more about your surroundings. They can tell us a lot when we are aware of them, of where they come from, and of what they mean.

Listen for a moment . . . what sounds do you hear? What is the source of each sound?

Sound	Source

How are these sounds similar? How are they different?
For example:
some are soft, some are loud

Are some sounds more pleasant than others? Which ones are they and why do you like them better?

*From HAILSTONES AND HALIBUT BONES, by Mary O'Neill. Copyright © 1961 by Mary Le Duc O'Neill. Reprinted by permission of Doubleday and Company, Inc.

Stop and listen at different times during the day. Do you hear different sounds at certain times in the day? Where are they coming from? Why do you hear some sounds at one time during the day and not at another?

Are there any sounds that never stop? What are they? If they never stop, why don't you hear them all the time?

Listen again. What is the smallest sound you hear? Try describing this sound with a cinquain as you did earlier with your favorite thing.

_____

_____ _____

_____ _____ _____

_____ _____ _____ _____

_____

The tiniest sound in the world
is a snowflake
as it
falls
from
the
sky
and
gently
turns
into
a
tear.

YOUR SENSES: USING THEM ALL AT ONCE

What is your very favorite place in the world? _____ . Describe it using all of your senses, trying this method for a start:

Use one word for color _____
Use two words for how the place feels _____
Use three words for how it sounds _____
Use two words for how it smells _____
Use one word for how it tastes _____

Make up your own ways of describing your favorite place. Use words, sketches, anything you wish. See if some of your classmates can figure out what your favorite place is just by looking at your description of it.

I like this place because it is up high and it is comfortable. Across the street there is a big pipe. It makes a noise that sounds like music.*

*from: Charline McDonald "A Place I Like," Washington Education, Washington Education Association, March 1970.

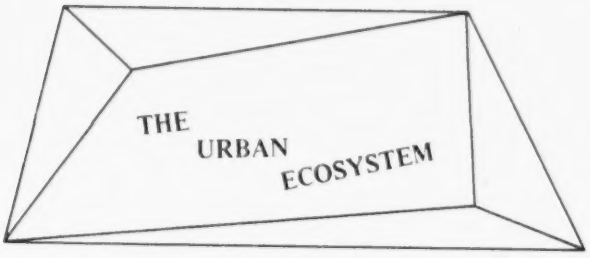
Teacher's Page

Long before man arrived, natural ecosystems existed on earth. The inter-relationships of organisms in these ecosystems were very complex, but in the long run they were naturally regulated and balanced. Man introduced the urban settlement and gradually developed ways to deliver essential commodities from the natural environment to urbanized man.

Man's urban settlements have grown and urban inter-relationships, or urban ecosystems, have become increasingly complex. But no matter how urbanized a man's way of life becomes, he and his neighbors are still part of the intricate natural ecosystem, too. Man depends upon plants and animals, sunshine, water, air, and soil for his life and good health. The functions which urban Man's mind and technology have contributed to the natural ecosystem are not always regulated and balanced in accordance with natural laws.

Every town has a history of settlement or urbanization. Some towns were founded with a large population in mind; some were not. Similarly, some towns expanded in a rational manner, while others mushroomed overnight. If you are trying to imagine what caused people to "urbanize" or move to your own town, think about some familiar urban settlements in history, such as ancient Greece or Room. What reasons did these people have for joining together in an urban community? Are some of these reasons still operative today? What problems do you think these ancient communities had in relating to their natural surroundings, and how did they attempt to solve these problems? The urban ecosystem today may be more complex, but it still relates directly to the natural ecosystem surrounding it.

Your path from the urban ecosystem to the natural ecosystem is more direct in some towns than in others. Each urban ecosystem promotes a certain style of life which depends on the town's size, its design, its function(s), its location, and many other factors. How does your town influence your life? You are closely related with many elements in your urban ecosystem. You can influence some of these environmental factors, just as they influence you.



Most of us live in a town. Some towns are small; others are very large. Each town has reasons for being what it is. Some were started because of ranching, others because of logging, others because of transportation. For some reason people came to live in a town. People of all types. People with different backgrounds. People with different goals. People living their lives in different ways.

How do you fit into your town?

How does your town affect your life and the lives of other people in it and arount it?

HOW IT GOT HERE AND WHY

Describe or sketch the shape of your town. You may need to refer to maps if you live in a large town or if you haven't seen it all. Maps and an atlas can be a big help for this activity. Describe or sketch your town's shape in a way that a person new in town could understand.

In the sketch or description you made of your town's shape, locate or describe:

1. residential areas
2. major stores
3. main highways
4. railroads and airports
5. large industries
6. schools
7. city or county parts

Why is your town shaped the way it is? As you investigate this question, record the natural and man-made features which cause this shape. Also, look into the history of your town area. What role did people play in influencing the shape of the town?

Man-made features	Natural features

Has your town always been this shape? _____

Make a simple sketch of how you think it looked:

25 years ago:

50 years ago

100 years ago

Why do you think this town was started here?

Finding out if you are correct can be fun. Dig into the history books and talk to some of the old-timers in town who probably have some interesting stories to tell about your town's beginning.

Is this the same reason your town exists now? _____
If not, what is the new reason for its existence?

What are some of the advantages and disadvantages to the town's location in relation to its growth? Think about how the town's location would affect it if the population were rapidly increasing, or if the town wanted to make improvements in its facilities and buildings.

Advantages	Disadvantages

What is the average winter temperature for your town or the closest town to you?

What is the average summer temperature? When is it the wettest in your town? When is it the driest?

winter _____ wet _____

summer _____ dry _____

What natural features most affect the climate of your town? Think especially about major land features such as mountains, lakes, etc.

Do you think the climate is a major reason for your town existing where it is now? Why?

Teacher's Page

The liveability of a town depends to a great extent upon the way its land area is utilized. Land can be used for many purposes, for example: for people (parks, malls, housing developments, scenic easements, open spaces); for institutions (schools, libraries, museums, prisons); for industry; for transportation (parking lots, wider streets, freeways, airports).

With our rapidly growing population, making proper land use decisions has become increasingly important and also difficult. There are many kinds and levels of land use planning done at different governmental levels. At the local level, many jurisdictions are adopting tools for land use control, such as zoning regulations, flood plain zoning, housing codes, construction codes, use permits, sanitation regulations, and pollution standards. You may also be interested in comprehensive land use planning proposed at the state and national levels; in some states, statewide planning, either comprehensive or for specific purposes, is already underway.

Thinking about your town's present land uses, perhaps you will say, "If only we could start over again!" You could list all the needs of your expected population and, through a process of compromising and balancing needs, design the ideal community. At the same time, you would evaluate the natural resources on your town site to determine the kinds of development that would suit each place best, and to identify those natural resources of aesthetic or environmental value which would require protection. You would establish land use and governmental controls to regulate urban growth from the beginning.

The designers of "new towns" in the United States and other countries are lucky because they can start from the beginning in planning a town (although designing a liveable "new town" is challenging, difficult work!). But "new towns" cannot meet all our people's needs. Those of us who live in old towns need effective land use planning and controls even more. Over a period of time, strong enforcement of these controls can help us preserve our cultural heritage while, at the same time, improving our buildings, our streets, and our open spaces to make life healthier and more pleasant for everyone.

Land Use

Land is a basic resource for all living things. How has the land in and around your town (urban and suburban) been used in the past? How is it being used now? How do you think it will be used in the future?

Sequence of land use in your town area

Land user	Use of the land	Type of settlement	Effects on environment	What residents value in the environment
Past				
Present				
Future				

Look closely at the map you made of your town. How much land is devoted to parks, shopping areas, industrial sites, etc.?

Use	How much

How would you like to see the land in your town area used in the future?

What agencies or offices make the land use decisions that affect your town?

Does your town have zoning laws? _____ If so, what types of zones are there?

List:

Does your town have any serious problems related to land use, such as major erosion, land slides, or floods? Are there provisions in your town's zoning laws to deal with these problems?

Land use problems	Zoning law provisions

Keeping your zoning laws of your town in mind, do you think land uses and the shape of your town might change in time if these laws were modified in some way? Why?

How does your town compare with its nearest neighbor? Think about the land use, climate, natural features, size, etc.

The nearest town is: _____
Comparison:

Teacher's Page

Without people, a town has no reason to exist. These days we are concerned that every town fulfill its purpose: to meet the needs of the people who live there.

People come to towns for many reasons. Some people bring a skill, seeking employment to earn their living. Some seek protection from the outdoors; they want the comforts of an urban home and life style. Some crave the opportunity to meet and learn from other people with backgrounds different from their own. And others seek the companionship of friends, or of an entire community which shares their customs and values. You can easily add more reasons to this list.

A variety of cultural histories and customs in any town lends richness to its character—to its streets and buildings, its celebrations, its political life, and to the moods of the people you see everyday. If we become interested in the life styles, in the pleasures and problems of people with backgrounds different from our own, we make new friends and at the same time grow to understand and appreciate our own lives more.

But as urban populations grow, governmental and other organizational structures must be developed to assure that people's basic needs are met, and that our resources, both natural and man-made, are being used to provide our people the best life possible. In most towns, the needs of some people are not being met. It is important that we recognize and attempt to correct poor living conditions if they exist in our towns. Towns are for <u>all</u> the people!.

YOUR TOWN AND THE POPLE WHO LIVE THERE

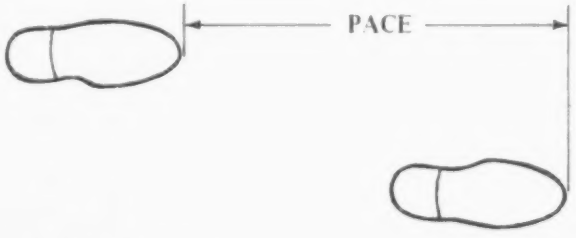
Population is more than just a certain number of residents. It is people, their similarities and their differences, that make population study interesting.

When studying the population and its traits, mapping is a useful tool. Before studying your town's population, spend some time learning how to make maps.

Mapping: A Useful Study Tool

It is important to know where you are! This is one reason people use maps. There are many types of maps for many different purposes. Sometimes it is useful to make your own map for your own purpose.

To make your own map, you must first determine your pace. Your pace is the distance you travel each time you take a step.



How to Determine Your Pace

1. Mark off 100 feet on level ground.
2. Travel the distance marked off in a normal walk. Do this twice, and count your steps each time.

number of steps taken first time _____
number of steps taken second time _____
Total Steps Taken _____

total distance walked	÷	total number of steps taken	=	your pace

Using Your Pace

1. When pacing, be sure to walk in normal easy strides (the same one you just used to determine your pace).
2. Count the number of steps it takes to walk the distance you need to know.
3. Multiply the number of steps taken times your pace.

number of steps taken	x	your pace	=	distance traveled

How far is it from:

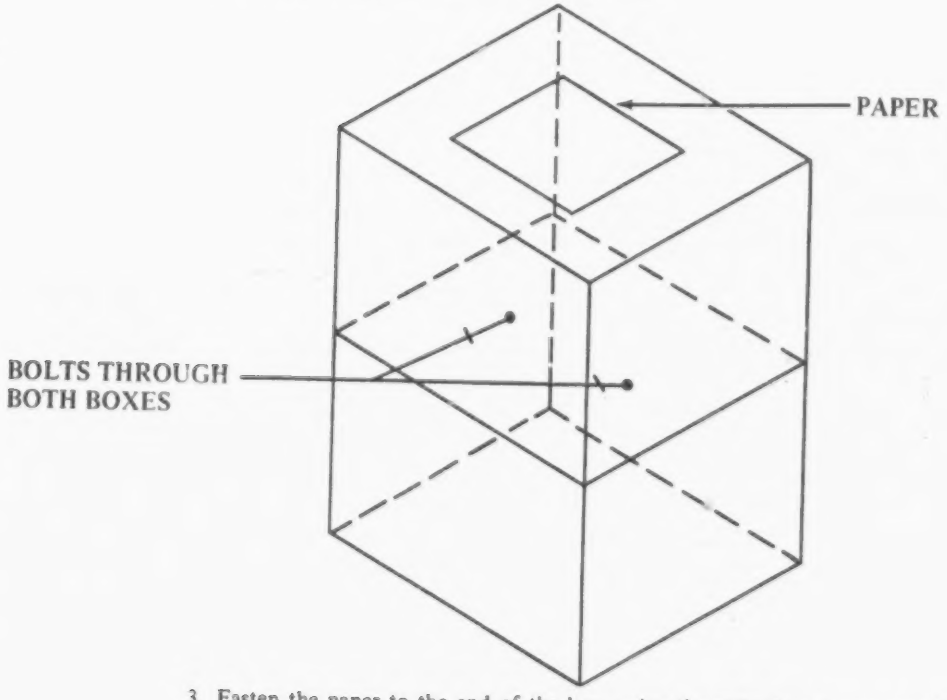
your classroom to the office and back? _____
your classroom to the gym and back? _____
your class room to the bus stop and back? _____
your classroom to the tallest thing in your schoolyard and back? _____

Directions For Making Your Own Map--Materials Needed:
(Try this on your schoolyard.)

2 cardboard cartons, the ends of each having minimum dimensions of 10" x 14"
2. bolts (¼" x 1") with which to fasten the boxes together (or nails)
1 sheet of unlined paper 8" x 10½" minimum
1 wooden 12" ruler
2 tacks or brads, ½" long
cellophane tape or masking tape
pencil
2 stakes, one blue-flagged and one red-flagged

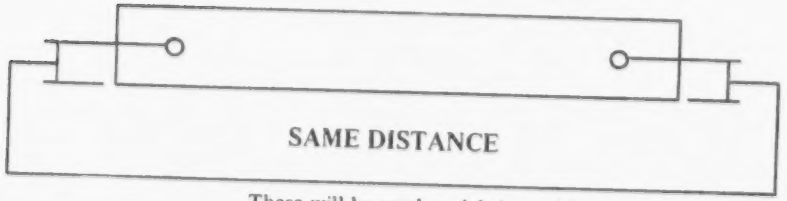
Method of constructing a plane table

1. Place one box on top of the other on their ends or sides depending upon your height.
2. Using the bolts, fasten both boxes together.



3. Fasten the paper to the end of the box, using the cellophane tape or masking tape.
4. Drive the brads or tacks into the ruler; both tacks must be equi-distant from each edge.

12" RULER



These will be used as sighting guides during mapping.

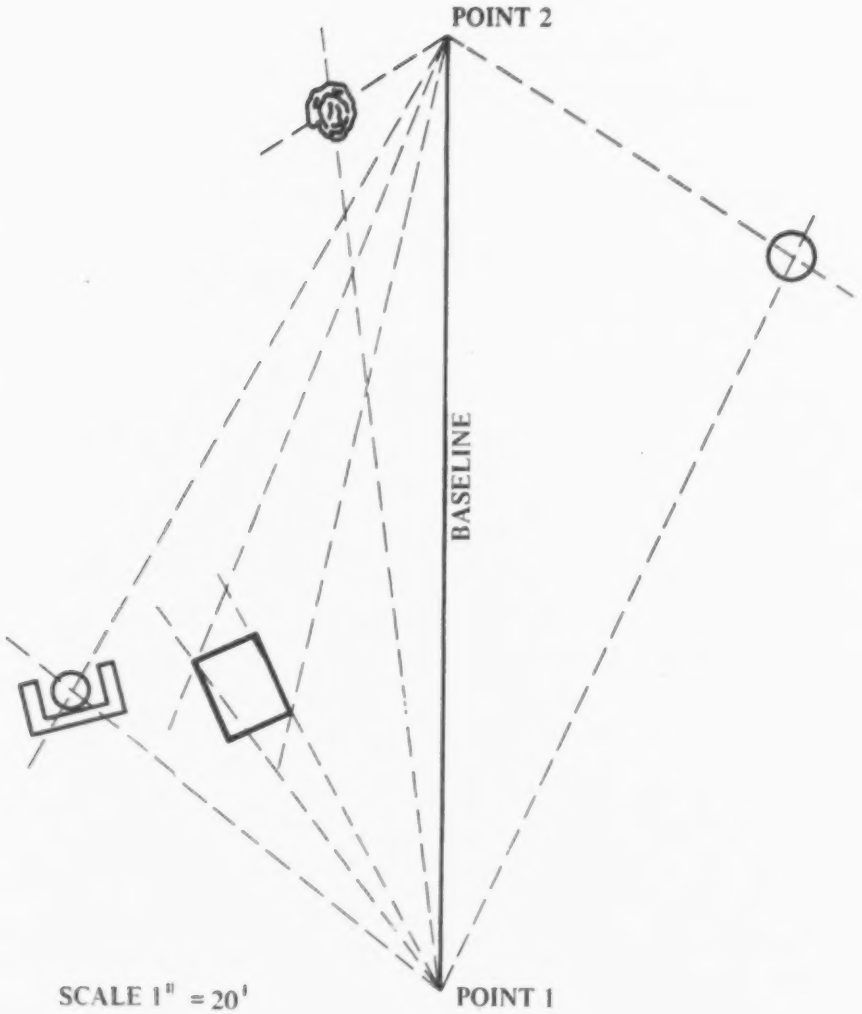
5. The table is now ready.

Mapping With The Plane Tabe

Two or more students should work together–some mapping and the others steadying the equipment.

Method of mapping

1. The size of the area to be mapped determines the scale of the map.
   Given an 8" wide paper, a scale 1"=100' will map a space 800' wide.
   Given an 8" wide paper, a scale 1"=40' will map a space 320' wide.
   Given an 8" wide paper, a scale 1"=20' will map a space 160' wide.
   (Since we are using standard rulers having inches and ¼ inches, the scale is best divisible by 4. Thus if 1"=40' then ¼"=10'. If 1"=20' then ¼"-5'. If 1"=80' then ¼"=20'.)
2. You must determine by observation and estimate, or by actually measuring the greatest distance between two objects to be included on the map. Your pace can be used to determine this distance.
3. Having decided upon a scale, now establish your baseline. Drive in the red-flagged stake at the base of the boxes.
4. Then pace across the longest distance that must be mapped and drive in another stake. The distance between these two stakes will be the only measurement needed.
5. Orient your map in the direction of this line. Draw this line on your map and place an X at each point. Label as Point 1 the location of your present point. Label the far one Point 2.
6. Lay the ruler so that one edge is along these points. Moving (turning) your box, line up the tacks or sight along the tacks from your present position to Point 2. This establishes your baseline on the map. The map must continue to be aligned with this baseline during all future mapping.
7. The theory behind using the plane table is to locate points by intersecting lines. This the next step you must take.
8. Keeping the base (end) of your ruler on Point 1, rotate the far end until the two tacks line up pointing toward the point to be established, that is, the corner of a building, a tree, porch, telephone pole, etc. Continue this with all things which you wish included on your map. When you have completed this part, you will have a number of labeled lines radiating from Point 1.
9. Now move to Point 2. The map must remain in the same general position in relation to Points 1 and 2 as it did at Point 1, so re-orient the map. To do this, place the heel edge of the ruler along the baseline, stand so that Point 2 is closest to you on the paper, and sight back at Point 1 placing the boxes so that the tacks line up with the baseline.
10. When this is accomplished start again to take sights on the various objects, as you did at Point 1, with the exception that where your line from Point 2 crosses that from Point 1, you can now draw in the object with the knowledge that you have established its location.
11. This procedure may be carried on indefinitely by setting up a Point 3 beyond Point 2, etc. This could be a prolongation of the baseline 1-2 or it may be in another direction.
12. When you have finished your mapping, set up your scale, a legend, date the map, label the area, and have the crew members sign it.



CREW: MJ
DH
BT

DATE: JUNE 19, 1970
AREA: RANCH HOUSE LAWN

LEGEND

GATE

HOUSE

APPLE TREE

LIGHTPOLE

People in Your Town

How many people live in your town or city? _____

Do a lot of people come into your town during the day for business, shopping, work, etc.? If so, where do they come from?

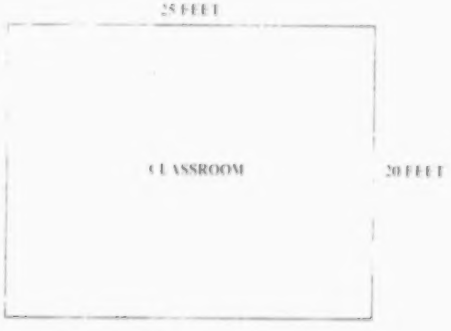
Is most of the population of your town located in the center or is it evenly spread out? _____ In order to find the answer to this have someone in your class contact your local tax assessor. When you receive your information, plot the population on a city map in your classroom.

Why do you think people live in cities?

Reasons why:

How large an area does your whole city occupy? _____ See if you can determine this by looking at a map.

How large an area does your classroom occupy? Using your pace, determine the length and width of your classroom. Multiply the length times the width. This gives the area of your classroom in square feet.



$$\frac{25}{\text{length}} \times \frac{20}{\text{width}} = \frac{500}{\text{square feet}}$$

Your Classroom:

$$\frac{\quad}{\text{length}} \times \frac{\quad}{\text{width}} = \frac{\quad}{\text{square feet}}$$

Next divide the number of people in your class by the number of square feet available. This equals the population density of your classroom, or the number of persons in a given area.

number of people	÷	number of square feet	=	population density per square foot

Knowing the number of people in your town and its approximate size, can you determine its population density? You can use square feet or square miles. Which is best?

What areas in your city or town are the most crowded? Locate these areas on the map of your city.

Areas:

If you have a chance, observe some of these most crowded areas. Are they similar in any way? _____ If so how?

Express how you feel about these areas using a sketch, a poem, a collage, etc.

Why do people live in crowded areas of their city?

Think about and look into the cost of living in crowded and uncrowded areas. Is there a difference? As a class you may want to complete the following chart:

	Crowded Area	Uncrowded Area
Average:		
rent		
food cost (per week per family of 4)		
utility cost (per month)		
electricity		
water		
phone		
transportation to work		

Does crowding in the city have anything to do with other problems such as poor schools, unemployment, or racial discrimination? How?

Do some experiments on crowding with your own class. For example, for one day try doing your regular class activities in half of the space you normally use.

It it pleasant to be in a crowd?_____, How do you get along with other students when you're crowded together like this?

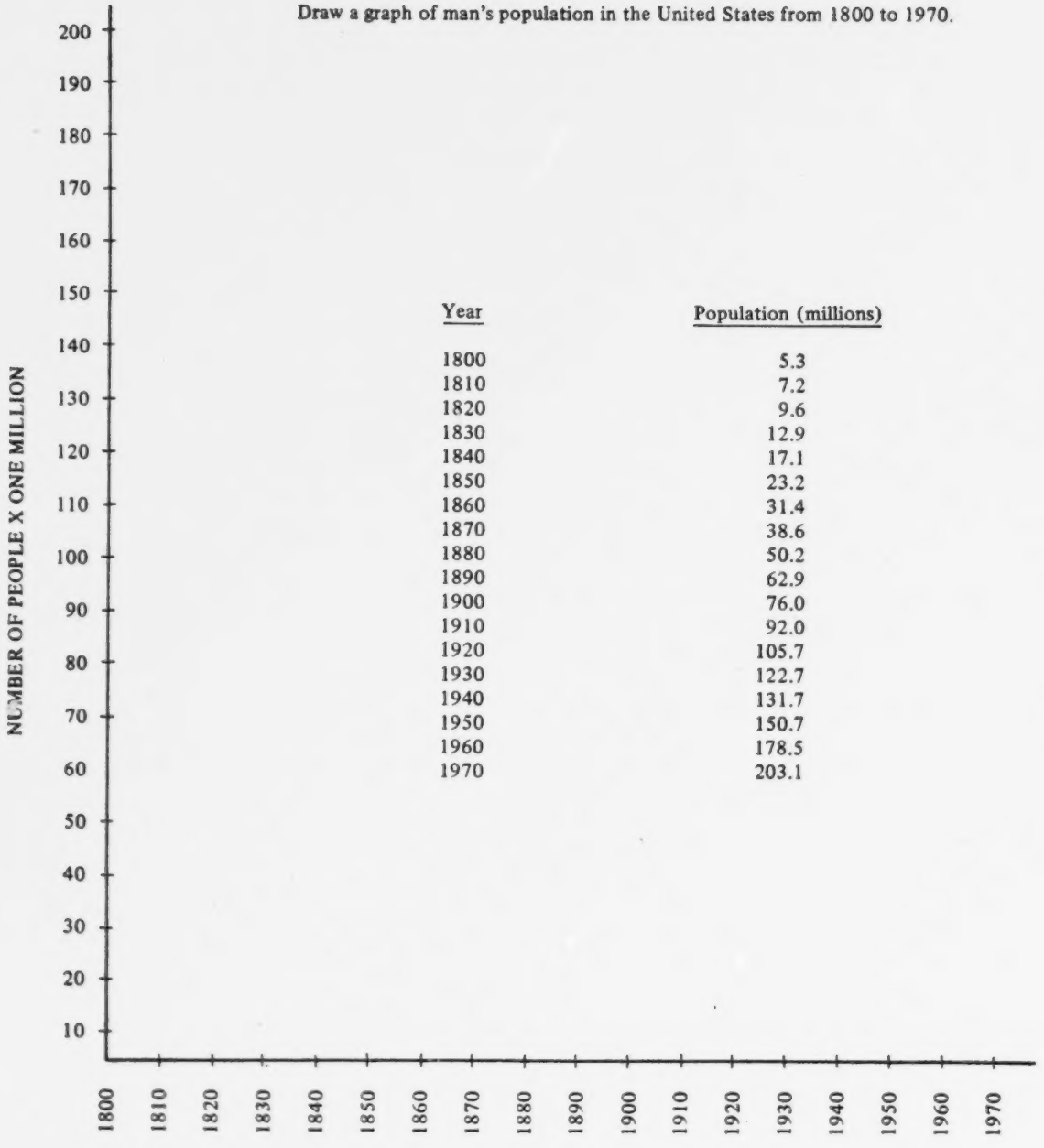
Using a short story, poem, or sketch describe how it feels to work in a crowded area.

In a park area or your city observe the activities of birds and animals such as sparrows and squirrels. Notice their behavior in relation to each other's area or territory. What do birds do when other birds approach an area where they are finding food?

What does man do when someone approaches his "territory"?

Thinking back on your study of population and the effects of crowding, how much space do you think an individual human needs to survive? Square feet _____. Did other students in your class come up with the same figure?_____

Draw a graph of man's population in the United States from 1800 to 1970.



Year	Population (millions)
1800	5.3
1810	7.2
1820	9.6
1830	12.9
1840	17.1
1850	23.2
1860	31.4
1870	38.6
1880	50.2
1890	62.9
1900	76.0
1910	92.0
1920	105.7
1930	122.7
1940	131.7
1950	150.7
1960	178.5
1970	203.1

449-391 O - 72 - 4

Think about the food you eat in one week. How much milk do you drink in one week? In 1970, the population of the United States was approximately 200 million. How much food would be consumed in a week if every person in the United States had the same amount as you? How much in a year?

_____ Gallons You Drink in One Week	x 200,000,000 =	_____ Gallons United States Could Drink in One Week
_____ Gallons United States Could Drink in One Week	x 52 =	_____ Gallons United States Could Drinking in One Year

Will people in the United States need more food 10 years from now? _____ Will they need more houses? _____ Why do you think so?

How many people are there in the whole world? _____ Listen and look for reports on population problems in other parts of the world. If you are interested, make a study of the population in some country of the world. What problems related to population is the country facing? For example, what do people there eat and how do they live?

Teacher's Page

Life styles and technologies have changed with lightning-quick speed during the 20th century. Our realization of this change is vivid if we think back to the homes we lived in just 20 years ago for clothes and fabrics, synthetics and blends did not yet play a major role–and popular fashions changed a little less rapidly!

Today a greater variety of foods and brands is available. Frozen foods are used widely, and we have added "freeze-dried" to our vocabulary. Packaging plays a significant role in food marketing today. Trends in home building, both in materials used and in housing types, have changed in many parts of the country. In all these categories–clothing, food, shelter–think of the many changes you have seen for yourself.

Many kinds of recreation today require new equipment. Our home appliances are far more versatile and complex. We have much more choice when we select a personal vehicle. Phenomenal advances have been made in communications and transportation, including modern mass transit systems, high speed air travel, and space travel.

Most of us are surrounded today, at our desks and in our homes, by so many things that we don't have time to use them! We are confounded to realize how many resources are tied up in the material objects we seem to accumulate without even trying.

Some of our resources are renewable: trees grow back if a forest is carefully managed over many years; crops can be raised year after year only if the soil is not depleted.

Other resources are non-renewable: when minerals are extracted they can not be replaced except perhaps over geological ages of time; when open space land is converted to urbanized development, it is almost impossible to recreate the original open space and natural values.

Some resources are interchangeable, too. In constructing homes we can choose from a variety of materials; we don't have to use those which are scarce. The same is true in choosing materials and fabrics for our clothing; we can select clothing and other merchandise which are produced with the least environmental damage. No doubt you can think of many examples with respect to foods and product packaging.

There is another alternative: to consume less and do without some of the non-essentials. It's too bad to see our resources wasted when we all recognize that many resources could be put to good use in helping our children and other people around us to a better way of life. Today we are seeing more public concern and joint action to conserve our natural resources and use them wisely–and an even greater effort by everyone is needed.

YOUR TOWN: HOW IT WORKS AND SURVIVES

"Modern man seems to believe he can get everything he needs from the corner drug store. He doesn't understand that everything has a source in the land or sea, and that he must respect these sources."

–Thor Heyerdahl

Where does everything in your town come from? Certainly not from the corner drug store or the super market or the department store–where then? Your town is composed of much more than people, businesses, and houses. Your town functions as a complex net of interacting systems. These systems, when they function properly, keep you informed, housed, clothed, and well fed.

The systems of a city are something like the systems of your body. If your body is not properly cared for it will not function as it should. In this section we'll explore further the life support systems of a city and the people in it.

Essential Products

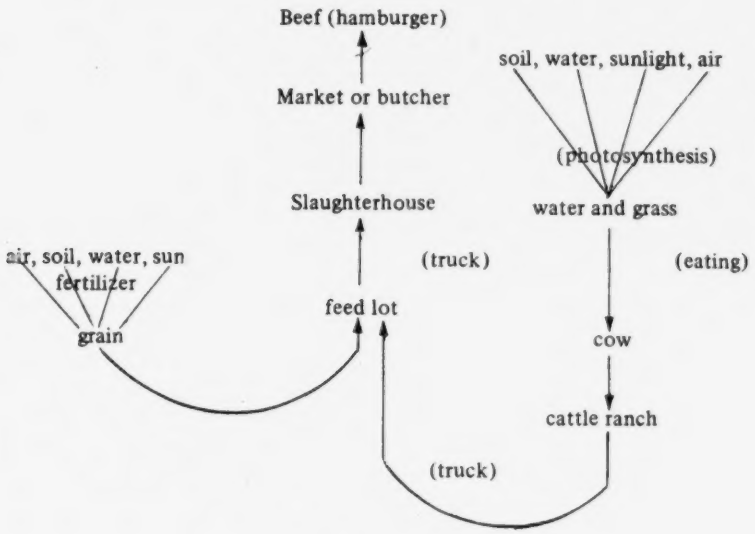
Using the chart, keep a week's record of all of the foods you eat. Compare your diet to that of the people in a country you previously studied. What are some of the reasons for the differences?

Types of Foods You Eat

	Meat and Fish	Dairy Products	Breads and Creals	Fruits and Vegetables	Candy, Softdrinks, etc.
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

Pick one of your favorite foods and trace back through all the steps it takes for that food product to get from the land to you. Find out exactly where the food product comes from. Does it come from far away? If so, how did it get to your town?

Sample of a food flow chart:



Your food flow chart:

How many steps has your food product gone through?

Do any of your foods actually originate from within the city? _____

_____

What land resources are necessary to provide the transportation for your food products? This gets fairly involved but it is interesting to discover how much you depend upon the earth.

Look around you in the classroom or in town. What non-living materials are present (such as wood, stone, plastic, etc.)? What are the sources of these materials? What basic ingredients go into the production of these sources?

Materials	Sources	Basic Ingredients
1. wood desk	trees	water, sun, air, soil
2. book		
3. sidewalk		
4.		
5.		
6.		
7.		
8.		

Pick an object which is made out of one of these non-living materials, such as a desk top or clothing, and trace all the steps it took to get the finished product to you from the original raw materials. Be sure to include the transportation and manufacturing steps that are involved.

Roughly speaking, how many people depend on the production and transportation of this product for their jobs and income? (A lot? a few?)

Water - Its supply and use

Water is a resource none of us can live without. Water has endless uses, and yet today we seem to be taking its availability for granted. As demands for water increase, we must utilize our water resources carefully since there is only so much available at any given time.

Where does your town get its water? Have someone from your class find out from your city government about how much water your town uses on an average day in the summer; in the winter.

Town's water source(s) _____
Average daily use (summer)_____
Average daily use (winter)_____

Is your town's water measured in any way? For example, is the amount you use measured with a meter? If so, how does this prevent water from being wasted?

Is your town's water treated in any way? _____

How is this done and what chemicals are used? Why?

What are the major uses of water in your town? Think not only about how families use the water but also about the industrial uses, etc.

Find out how much water your household uses in a day or month. You can figure out what the major uses of water are in your household by taking a few simple measurements. For example, a toilet uses about 7 gallons of water every time you flush it. Can you figure out how much water is used in:

1. the bath or shower _____

2. the clothes washer _____
3. watering the garden _____
4. personal consumption _____
   (drinking and cooking)

Does the water leave your household in the same condition as it came in? _____

How has it changed?

What happens to the waste water after it leaves your house?

Is there a sewage tratment plant in your town? If not, why not?

If the sewage is treated, what kind of treatment does it receive and where does it go after treatment? Locate this place on a map of your town.

The disposable environment?

A major problem today is the disposal of solid wastes. Not only do we have to worry about where to put our discarded cars and our aluminum, plastic, and glass containers; we must also concern ourselves with the depletion of the resources that go into making these products.

How and where does your town dispose of its garbage? Is this posing any problems for your town? What?

An interesting project is to figure out how much solid waste your household is producing per day. Using a bathroom scale, determine how many pounds of various types of solid wastes your household produces each day for a week.

Day	cans and Metal (lbs.)	Paper (lbs.)	Plastic Products (lbs.)	Food Refuse (lbs.)	Glass (lbs.)
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					
	Total	Total	Total	Total	Total

Add the weekly totals of each type to discover the amount of waste your household produces in a week.

amount per week x 52 = amount used per year

Think about the kinds of waste and why they come into your house in the first place. Could your household reduce the amount of waste it produces?

Kinds of waste	Ways you can reduce waste

Do you think any of these "waste" materials could be reused? If so, which ones?

Materials which can be reused.

Of the materials being thrown away, which ones originate from resources which can be restored by man? Refer back to the table you made of materials, sources, and basic ingredients on Page 44.

Resources which can be restored by man:

1.
2.
3.
4.
5.

How are these sources renewed? To find out, assign members of your class to contact the local agencies which deal with the land and its resources.

Of the materials being thrown away, which ones originate from resources which cannot be restored by man? Refer back to the table you made of materials, sources, and basic ingredients.

Resources which cannot be restored by man:

1.
2.
3.
4.
5.

Energy: critical needs or excessive wants?

In our "all electric world" we often take for granted the electricity we use for light, heat, and power. Most electrical power is generated by the combustion of stored fossil fuels, the controlled reaction of radioactive materials, and utilization of the potential energy present in falling water. Try to find out what effects the construction of new power facilities may have on your environment.

What is your town's source of electrical energy? _____
How is it produced?

How do you use electrical energy in your day-to-day life? For one day, keep track of the times you use electricity. Also list the purpose for which you used this electricity.

My daily use of electricity:

use	Purpose
example 1. electrical can opener	1. open dog food can

How many of these uses could you do without and still lead a comfortable life?

There is currently a great concern in our country over power shortages. Can you think of any way to eliminate this shortage without producing more electricity and building more power dams; How?

How is your home heated?

What is the original source of this energy?

Industrial effects on your town

One of the main reasons for people moving to the cities in this century has been the location of jobs. People in the city depend upon their job for an income which will buy food produced in the rural area as well as other goods and services. Both good and bad effects result from an industry locating in a town. Jobs are created and income flows in the town, but negative effects can also occur.

What is the main industry (or industries) in your town?

About how many people in town depend on this industry for their living?

How might the climate affect the types of industries located in your town and their operations?

Think of the effects (both good and bad) that this industry has on:

land	animals	people
air	water	you
	the town	

Give some examples:

	Good	Bad
land		
air		
animals		
town		
people		
you		

Teacher's Page

Is pollution everywhere, or do people just make it sound that way? You can decide for yourself whether pollution is a problem in your community. Start sniffing, and listening, and looking carefully around you. Some of us have grown up with or become accustomed to objectionable odors, excessive noises, and offensive sights, but now these environmental conditions have become "pollution."

You can "feel" your environment, too. Do you notice the pavement under your feet? Can you feel the breeze? Do you prefer a city mall or a county park? We need to remember that man-made as well as natural environments can be pleasant.

When your senses tell you "pollution!", the time has come to track down the sources. The causes of pollution are usually complex. Factories, buildings, vehicles, sewage systems, power plants, resource extraction processes, towns themselves—all exist to produce the many things that people need and want. Generally speaking, there are several ways to reduce the pollution that results. Many conservation and other groups which offer solutions to our environmental problems have received nationwide publicity, so you can probably list many of their ideas, and your own as well.

Pollution occurs in agricultural and wilderness areas as well as towns. Some farm practices and development trends must be modified to protect these areas. Environmental changes in non-urban areas often occur more slowly, but over a period of time they reduce the amount and productivity of our Nation's lands and resources that are available to promote good health and enjoyment for everyone.

To recognize environmental pollution, it helps to understand ecology—the inter-relationships among living things and non-living things in the environment. Ecological relationships exist everywhere—deep in the city or out where the country is filled with plants and wildlife. Most of us need more knowledge about ecology. Such knowledge can help us determine standards for cleaner water and air, for rational land use, and for protection of all living things.

Institutions such as businesses and governments pollute, but we as individuals cause pollution, too. We should keep in mind that modern technology has brought man many benefits in terms of health, comfort, education, and communication. We do not want to throw these advantages away. But we should weigh carefully the pros and cons of complex inventions and development. We should evaluate our own demands and habits thoughtfully, and make personal choices which favor a healthier environment.

PROBLEMS IN YOUR TOWN: AIR, NOISE, WATER

Why problems occur

Pollution—Where does it come from and why does it occur? You can answer these questions for yourself by looking at the processes which various materials go through to become finished products. The production of goods and services for people usually has both good and bad effects. Bad effects occur in the form of pollution and good effects in the form of desirable products and employment. In an earlier part of this guide (Page 43), you traced the steps it takes for various materials to reach you as finished products. Now you can take a closer look at this process.

Think of a product that you use often. On the following pages, detail the steps it takes from: raw material → production → finished product → use → disposal. For each step decide what the good and bad effects are. Be sure to look at the processes involved in each step of production and also what happens to the product after it is used. This may take some research.

The product is _____

Raw Materials:

List:

What happens to the raw materials before they go through the production process?

good effects

bad effects:

Steps in production:

List:

What effect does each of these steps have?

good effects:

bad effects:

Use of finished product:

What do you do with the product after you get it?

What effect do these uses have?

good effects:

bad effects:

Steps in disposing of waste from product or wornout products:

List:

What effects does disposing of this product or its wastes have?

good effects:

bad effects:

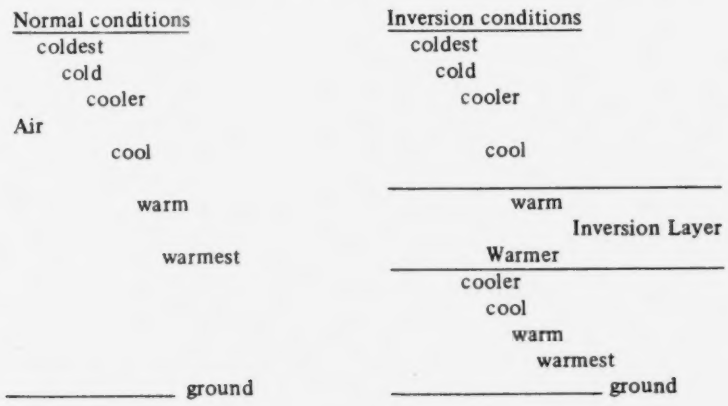
Air

Observe your city from a hill or tall building. What are the sources of the pollution you can see, hear, or smell?

Sources	Type of Pollution
example: incinerator–from burning waste materials	smoke in air

Locate and describe the source and type of pollution on a map of your city. Does this pollution occur near any residential areas? _____ If so, how might it affect the people who live there?

Notice the days when your city's air is dirtiest; find out what the weather pattern is on these days (high or low pressure, velocity, wind). Find out from the weather bureau in your area if inversion conditions ever exist. (Inversion conditions occur when a warm layer of air is trapped between two cooler layers of air.) This prevents the atmosphere from mixing, and air pollution could be more serious on days like this. See the diagram below.



From your exploration of the weather do you see any relation between days of bad air pollution and the weather patterns over your town? _____ If so, what is this relationship?

Do you think smoke can be emitted in large quantities on any day without causing an air pollution problem or should the daily weather patterns be considered before allowing smoke emissions? Why or why not?

A lot is said about how bad air pollution is and what a major problem it is, but have you figured out how it affects your life? Here are some questions and activities your class may want to try to help you learn more about the effects of air pollution.

At home or at school, designate as a dust indicator a table or similar surface. Leave it undisturbed for three days with a white handkerchief on it. After three days note the dust accumulation on the handkerchief and look at it under a hand lens or other magnifier. What does it look and feel like?

Do you have any idea where some of the particles came from?

Notice what accumulates on a clean car after it is left out overnight. Keeping this in mind, how do you think dirty air affects your life, or does it?

What would this air do to your clean clothes if they were hung outside to dry?

What might this air do to your lungs?

Now that you've thought about what dirty air does to man, what might this air do to affect other animals?

How do you think dirty air can affect plants?

How do you think air pollution is measured? You can learn about air pollution standards from an official of the local air pollution control office which monitors your town.

Using a poem, cinquain, sketch, story or anything else you wish express how you feel about the air in your town.

If there is an air pollution problem in your town, set up a class project designed to help solve this problem. The use of games with students playing the role of various community groups is an exciting way to learn more about solving a community problem.

Here is an example of a simulation game which your class might want to try:

The Problem:

An industry in town is putting out great quantities of black smoke as a result of the burning of its waste products. The town is located in a valley which means the smoke is not blown away easily. A group in town has formed to stop pollution of the air. This group is complaining to the town council about the smoke problem.

The industry says it cannot afford to change its method of waste disposal. Other people in town oppose the control of the smoke because they feel it will discourage industry from moving to their town. They say this would prevent economic development.

The Players:

1. Town Council–This is the town's governing body which will decide whether the smoke pollution will be stopped. The purpose of the other groups is to persuade this council through their representative that their position is correct.
2. Industry Representatives–This group represents the industry which is causing the smoke pollution. They are naturally concerned with their interests and want to keep their profits at a maximum. However, they are interested in public opinion and may respond to public pressure. The group claims that their economic development will be harmed if strong controls on smoke emissions become law.
3. Citizens for Clean Air–This group is determined to solve the smoke pollution problem as soon as possible. Its members believe that a clean environment is more important than a profitable industry in town. The group also believes that the waste product being burned could be put to a valuable use. Most people in this group do not depend on the industry for their jobs.
4. Citizens for Economic Development–This group is composed of businessmen and also people who work for the industry causing the smoke pollution. They are siding with the industrial group since they are concerned with the town's economy. However, this group realizes that environmental quality is important and might seek a slow, gradual solution to the problem so that the industry is not hurt.

Procedure:

Divide the class into the various groups. Each group should meet and discuss what it wants the town council to do about the problem, and what the group thinks is needed to make this a better place to live. The ideas should be based upon some research into the problem, not just personal opinion. Elect a spokesman for each group to present its "case" to the town council when the class meets as a whole again.

The town council should elect one of its members to be in charge of the meeting. After listening to the representatives from the different organizations the town council should come up with a list of priorities—a list of what it is going to act upon first, second, etc. Your class may wish to invite a member of the real town council to meet with you and discuss your ideas.

Conclusions:

What solutions to the smoke pollution problem did the members of your class think were the best?

What is your own opinion about the smoke pollution problem above?

If your class found the smoke pollution problem interesting, you may want to find out if there are groups in your town discussing or working together on a major problem concerning land use, air pollution, noise pollution or water pollution. Perhaps someone in your family is interested in pollution problems. Also, your local newspaper probably has articles on major problems in your town.

List your town's major problems:

Which of these problems is the most serious right now?

What persons or groups are involved in this serious problem?

The class may wish to invite someone to discuss this problem. Think about the ways members of your class might help solve this problem and discuss your ideas with your guest.

List several ways you can help solve this problem:

Noise

Recall what sounds were heard in the first part of the guide, Page 17. When and where were the sounds the loudest and the most common?

Look again at the map your class made on population density (Page 35). How does the location of loud sounds compare to the parts of your town which are most crowded?

How do these locations compare with those from which the air and water pollution in your community are coming?

Is there any relationship between water and air pollution and noise pollution?

If you think so, what is the relationship?

Could noise pollution have a bad effect on people? How?

Have you ever heard a noise so loud you couldn't stand it? What caused the noise, and what did you do?

What are the regulations controlling noise in your town?

Do you know how noise is measured? Can someone in your town help you learn about this? Record what you find out:

List some animals, birds and fish you know about. How much noise can they tolerate? Is it more or less than man can tolerate? What activities of these animals do loud noises disturb?

As a class choose one object with an annoying noise and try to quiet it.

Object:

Method used to quiet noise:

Was it successful? Why or why not?

What object would you like to quiet the most now?

How would you go about doing this?

Describe by either a sketch or a poem why you find this noise annoying.

Water

What river or creek runs through or near your town? _____

Where does it start? If you do not know, look at a state map or a map of the United States.

What happens to this river or creeek as it flows to join a larger body of water or the sea?

Where are most of the towns located on the river or creek: near the beginning or where it joins a larger body of water?

What do you think will happen to this river or creek as it runs through the town? What materials will probably be added to it?

What materials will probably be taken away?

With your class, travel to a place along the river or creek upstream from your town.

With one word describe how the river smells. _____
With two words describe how it looks. _____
With three words describe how it feels. _____
With two words describe how it tastes (if safe). _____
With one word describe how it sounds. _____

What materials do you see in and along the water which don't really belong there? For example, are there any old tires or tin cans? What else?

List of materials found:

What can you do to help correct this problem?

What plants and animals do you find living in the water?

Plants: name, describe, or sketch	Location (edge, middle, etc.)

Animals: name, describe or sketch	Location (edge, middle, etc.)

Animals that live in the water cannot stand too much acid or alkali in the water. Using a pH kit, test the water to determine how acid or alkali it is. Follow the directions found in the kit.

What is the pH of the water tested? _____ _____

Looking at the chart below, what animals would most likely be found here?

What plants would be found here?

pH Ranges that support aquatic animal and plant life

Most acid	Netural	Most alkaline
1	7	14

6.5-7.5
largest variety
of animals, trout,
mayfly, stonefly,
caddis fly

7.0- - - -9.0
snails, clams

6.5- - - - -8.5
bass, crappie

.60- - - - - - - -9.0
carp, suckers, catfish,
some insects

6.5- - - - - - - - - - - -12.0
plants (algae, rooted, etc.)

1.0- - - - - - - - - - - - - - - - - - - -bacteria- - - - - - - - - - - - - - - - - - - -13.0

All life needs oxygen in order to live. Pollution reduces the amount of oxygen in the water. So do water plants. Using the pH kit, test for the amount of usable oxygen present in the water. Follow the directions given in the kit.

What is the water's oxygen content? _____

Looking at the chart below, how much life can this amount of oxygen support? _____

Useable oxygen in ppm reading	Variety of life
below 5	very little life can survive
above 5	large variety of life

Now travel to a place on the river just below the town and examine the water. Using all your senses describe the water in the same manner as you did upstream.

_____

_____ _____

_____ _____ _____

_____ _____

_____

Do you find the same type of materials, such as cans and paper, in and along the river as you found upstream?

List the materials you find here:

What plants and animals do you find living in this part of the river?

Plants: name or describe	Location (edge, middle, etc.)
Animals: name or describe	**Location (edge, middle, etc.)**

What is the pH of the water here? _____

Looking at the previous chart, what animals would most likely be found here?

What plants would be found here? _____

What is the oxygen content of the water here? _____

Looking at the previous page, how much life can this amount of oxygen support? _____

Is there any difference between the water above and below your town? _____ . If so, what and why?

Where did you like the river the best? _____ Why?

Make a drawing of what the river would look like if it ran through a hundred towns just like yours. Would you like to live in a town along this river?

After finding out about your town, its life support systems, and its problems, describe how you would most like your town to change and why. Use a sketch, a poem, a story, or anything else you wish.

SECTION IV

Environmental Problems

AIR POLLUTION

Air acts to rid the earth of wastes. It acts in such a way that it makes itself pure. Today the air is in danger. We are putting more waste into the air than it can rid itself. This adding of waste material to the air is called pollution.

There are many ways in which the atmosphere becomes polluted. Some are caused by man and others come from the action of nature. A product of bruning is carbon dioxide. All fuels which come from living, or once living matter, contain carbon dioxide. When they burn, carbon mixes with oxygen in the air to form carbon dioxide. Some carbon dioxide is taken out of the air by plants. Man has added to the amount of carbon dioxide in the air by large amounts. Since it traps the sun's rays, the temperature of the atmosphere rises. Scientists believe that if this goes on, many forms of life will not survive. Other things in the air are nitrogen; cars give off nitric oxide; some of these can be poisonous, some good. Some forms of sulfur in the air can harm eyes, skin, and lungs.

The air that makes city dwellers sneeze and wheeze cost every American $65 per year -- a total of $11 billion in medical bills, corrosion, crop damage, cleaning, and so on. Can students cite examples of these expenses?

Scientists say that if air pollution is not halted by 1985 the amount of sunlight reaching the earth will be reduced by one half. Today air pollution shuts out 45 percent of the sunlight over Los Angeles and 25 percent of it over New York City. An estimated 5 percent is shut out over rural areas. Have students discuss why this is so. They may want to guess how much sunlight their area receives.

When the atmosphere can no longer handle the waste, serious things can happen. Smog, a mixture of fog and smoke, often hangs over large cities. Air pollution can cause sickness and death.

Air Pollution Activity

Materials: Vacuum cleaner, Filter paper

Put filter paper or disc over pipe where the bag would usually be. Use pipe without a fixture on the end.

Put cleaner with the pipe outside a window. Let it run for about 1/2 hour. Do the same with several windows around the school. Try it at different times of the day and in different kinds of weather. If possible, by using an extension cord, put the cleaner out away from the building towards a street. (Can be done during play period so someone can watch it).

Compare the filters taken from each of the times, different days and different times of day.

Questions:

At what time of day does the filter show more pollution? Why? (If in morning, more cars on the roads. Sun has not heated up the air so that dust etc. will rise).

Was there any area of the school that had more pollution? Why? (This might be near a street or a house burning trash, etc.)

Are there any stores, factories in the area that might make more pollution for this area? (Check and use smoke chart)

Does weather have anything to do with air pollution? (On windy or wet days there will be less pollution in the air)

Can you see the pollution? (In some schools the "cloud" over Nashville can be seen very well, particularly in the early morning)

Would certain times of year be more likely to have pollution? Winter, because of fires and coal burning.

Put the cleaner next to a car exhaust pipe and run it for a while. Try several cars.

What makes the filter so dirty? (Lead in the gas and other chemicals.)

Would a bus or truck have more pollution than a car? (Yes)

How could car pollution be made better? (New types of cars, electric or steam, less driving by one or two people, more mass transportation)

Some discussion here on why the new types of cars would be hard to use. See current materials in papers and magazines for articles on possible new cars. Suggestions on taking lead from gas or new ways to stop the pollution. Sixty-percent of air pollution comes from the car.

Determining Air Pollution

Most cities and suburbs have air pollution problems. Each day, factories, apartment houses, cars and trucks send tons of pollutants into the air. In a large city many tons of pollutants are released into the air during a 24-hour period.

How much pollution is there in your area? Let's find out.

Equipment: Microscope slides (or glass plates)
Petroleum jelly
Sheet of white paper
Masking tape
Magnifying glass (or microscope)

What to do:

Coat one side of each slide with petroleum jelly. Select several different areas within your city or suburb to place the slides. Some possible locations: school or home rooftop; friend's home; window ledge. Label the location of each slide on masking tape that you attach to the slide. Also write the location of each slide in the box below.

Hang the slide from a clothesline or other similar support. If this is impossible, the slide may be placed flat on a surface. Expose all the slides about the same length of time (one day, two days, a week).

After collecting the slides, place them on a sheet of white paper, with the coated side up. Examine them under strong light with a magnifying glass or under a microscope. Compare these slides with slides that were kept indoors in a closed box or drawer.

Observations:

Are there any particles on the surface of the slide? What kind and amount? Describe the particles in the box below. What area had the dirtiest slide? The cleanest? Are all the particles the products of man or are some natural?

Try to find a way to determine the hours of the day when most pollution occurs and also which days in the week.

Can you find the source of some of this pollution? In what ways could this pollution be reduced? Divide your suggestions into individual, community or neighborhood, industrial, and governmental responsibility.

What can you and your friends do to help?

POLLUTION IN THE AIR

LOCATION	TIME EXPOSED	DESCRIPTION OF PARTICLES	AMOUNT OF POLLUTION

Questions:

Why would the particles we see on the slide be bad for us? (Get in nose, lungs).
Where might they have come from? (Smoke, car fumes, waste).
How could the pollutants seen here be controlled? (Depending on what they are--stop burning coal, change method of engine, finish job nearby of blasting or construction).

A. Hang a damp, white piece of cloth outside for a week. After the week is up, check the cloth to see how much dust and other material has fallen on it. Answer same question.

Why would the particles we see on the cloth be bad for us? (get in nose, lungs)
Where might they have come from? (smoke, car fumes, waste)
How could the pollutants seen here be controlled? (depending on what they are--stop burning coal, change method of engine, finish job nearby of blasting or construction)

B. Put a bucket of clean water outside before or during a rain, Strain the water; check the pollution.

Questions:

Why would rain have pollution in it?
What might this do to the soil? (some pollutants would be bad, retroactive, materials can be absorbed by plants and when eaten by animals, come back to man. Some would be good, nitrogen is needed by plant and that in the air can become mixed with rain and returned to soil).

On TV weather, some weathermen will report on air pollution for that day. Keep a chart of what is said. See if you can tell if there are certain days on which more pollution seems to occur. Record what type of a day it was. Try to see if there is any connection between the type of weather and the amount of pollution. Does the barometer reading change with the pollution? How about humidity of the atmosphere?

C. Use a special chart to figure amount of pollution in smoke air pollution.

Using the Ringelmann Smoke Chart--Insert in proper place. The smoke chart is used to determine if smoke emissions are within the law. The chart shows graduated shades of gray, in equal steps from white to black. Since carbon is usually the worst pollutant the color help in deciding if there is a great amount of air pollution from the smoke. To use the chart, support it on level with the eye, at such a distance from the observer that the lines on the chart merge into shades of gray, and as nearly as possible in line with the stack. The observer glances from the smoke as it issues from the stack to the chart and notes the number most nearly corresponding with the shade of the smoke, then records this number. A clear stack is recorded as No. 100 percent black smoke as No. 5. This can be done several times a day to see if the same density continues. The "law" in Nashville, based on this chart.

OTHER THINGS TODO:

Watch for new items about air pollution--put on board or make a scrapbook.
Draw posters and cartoons about air pollution.
Discuss possible laws that could be passed about air pollution.
Find out what has been passed.
Discuss what kinds of health problems can result from air pollution.

AIR POLLUTION

ACTIVITIES FOR CLASSROOM

REMOVING PARTICLES FROM THE AIR

Materials

Plastic Microscopes Slides
Petroleum Jelly
Masking Tape

Coat two slides from thin plastic with the jelly. Tape one of the slides to one corner of the TV set and the other to a wall or window on the opposite side of the room. After several days notice the greater accumulation of particles on the slide taped to the TV. This is caused by the electrostatic field created when the TV is operating. It is the same principle as a magnet picking up nails. Check the slides with a magnifying glass to get an idea about how many particles have collected on each. These represent the foreign matter in the air you breathe in the school room or at home.

Many plants are using this type of "magnet" to draw particles from the air. This helps keep areas clean. Some laboratories must be spotless and this principle was also used in the space program. A special air cleaning machine can now be bought for homes and other places.

Darken the classroom as well as you can. (Try this at home also.) Aim the beam of a flashlight or projector at a wall. Notice the number of particles that will show up in the light. These are pollutants and are very irritating to the human body. Try this experiment in several areas. You can tell which area or room in your home has the cleanest air.

Materials

Slices of Boiled Potato
Foil or Wax Paper
Aluminum Dishes

Potatoes will easily accumulate pollutants. Wrap one slice of the potato in foil and put into a refrigerator as a control slice. Put the other slices in aluminum plates (pie pans are fine). The peices of potato will collect dust, bacteria and pollen and will grow fungi and colored colonies of bacteria.

Put the slices in different spots so you can compare the air. Each day look at each slice with a magnifying, also, keep a record of the results. Day by day and week by week comparisons will show rapid accumulation of polluting particles.

You can put slices in many spots out of doors also. This experiment can be photographed as well as recorded.

Press your fingers against a piece of boiled potato. Observe it from day to day. It will grow bacteria more rapidly than the other samples, indicating that your hands attract bacteria which are exposed by this test.

1. Have the children list different ways each family contributes to air pollution, both in and out of the home. Help them to understand the reasons for such pollutors as hair spray, using lots of electricity, smoking, driving cars, burning trash and leaves, spraying and cooking outside. Discuss which of these can be changed or stopped. What affect would it have on family life? Which would have on family life? Which would be easier to give up? How can each family help in doing away with air pollution?

2. Put up a bulletin board display using such things as lichen, nylon stockings, gauze mask, toy models of cars and buses, toy airplanes, and spray gun. As you and the children discuss air pollution you can use one of the objects to point out some things that help hold down pollution. (Explanation - The lichens on the trees are the first plants to show very bad air pollution. Nylon will often melt with some fumes in the air.)

3. Put up an Air Pollution Chart as used on TV. Have one child a week place the marker on the index number. On days when it is very high see if the children can tell why and if they can detect it outside. Plan one of the outdoor "testing" sessions on both a low day and a high day.

4. Have each child keep an Air Pollution Dictionary. As new words are introduced have the children write them in their booklet with their definition. Pictures can be cut from magazines or drawn to illustrate the booklet.

5. Make some carbon dioxide chemically. Put about a tablespoon of baking soda in a small jar and add four tablespoons of vinegar. The bubbling action produces carbon dioxide. Put a lighted match into the top of the jar. The flame will go out. Question: When two materials are combined can other materials be produced? Could some of these materials pollute the air? If there were no trees in the city where would the carbon dioxide go? People breath carbon diocide into the air with every breath. Many fuels also put it into the air.

6. Put a cold white saucer over a burning candle. Ask the children to imagine that the candle is fuel being burned in a car. The soot on the saucer is what might come from the exhaust of the car. Use a wick or bunsen burner and burn the soot. Would this be one way of getting rid of the pollutants from cars?

7. Put a piece of nylon stocking in a jar and sprat it with diluted hydrochloric acid. Look at it with a magnifying glass. Notice how the nylon has come apart. Could this happen to other man-made materials? Try several other types of materials.

8. Make a frame with a piece of nylon stocking in it and put it outside where it won't be disturbed. Leave it for 5 days and then look at it with a lens. Notice any damage. Put it back out and leave it for another 5 days. See if there has been any more damage.

9. Wash an outside window pane in the schoolroom. Watch the dirt that collects in a few days. How does this affect the cost of keeping things clean?

10. What might happen to statuary and art works? Are they affected by pollution? Have a group of children make a report on this.

RELATED ACTIVITIES

Write letters to city officials asking what is being done about air pollution in your city. If you have a record of any pollution in your area, include the study.

Invite the Health Department to present a program on Air Pollution and our health.

Make some posters and put in windows of near by stores. Take a deep breath - If you don't like what you smell, write the mayor.

End your unit with a program for parents and other students.

Make up songs and "pollution resolutions". Debate the pro and con of solutions to problems that might have been brought up by the class.

If a camera is available make a series of slides, good and bad, and prepare a tape to go with it. Offer it to other schools.

Display all of the lab reports and observations so all of the school can see them. Have students explain in their terms what they mean to younger students.

ACTIVITY OUT-OF-DOORS

FINDING OZONE IN THE AIR

Ozone is a gas that in extreme amounts can cause plant life to die. You can detect the presence of ozone with the following experiment:

Take a shoe box and cut slits in the side to let the air in. Attach a piece of rubber to the top of the box with a staple. Put a small weight on the other end of the strip. It should be heavy enough to stretch the rubber. Put the box in a horizontal surface so the sun's rays don't strike the rubber strip. This is important as the sun light will damage the rubber.

After about 7 days remove the rubber and look at it with a magnifying glass. Any cracking shows the presence of ozone. Keep this sample and try the experiment several times. See if the level of ozone increases or decreases.

CLOTH TEST FOR AIR POLLUTANTS

Materials

Pieces of Brightly Colored Cloth
Wire Coat Hangers
Staples or straight pins
Plastic wrapping material

In this experiment you will be able to show that certain air pollutants will cause dyed fabrics to fade. Oxides of nitrogen and ozone in the air may cause fading. These are in addition to strong sunlight, washing, heat and humidity.

Select an old brightly colored garment. Cut into squares which you then staple or pin to a coat hanger. Wrap another sample of the same cloth in plastic wrapping to keep the air away from it. This is the control and should be stored in a cool dark place.

The sample for testing should be hung out of doors away from direct sunlight. Each week compare the exposed sample with the one sealed away.

A noticeable fading indicates the presence of pollution. Discuss this experience in relation to the cost of clothes.

ACTIVITY OUT-OF-DOORS

Take a walk outside with the class. Have a recorder. Look around.

1. Are there any signs of air pollution?
   Factories _____ Cars _____ Buses _____ Airplanes _____ Fires _____

2. How does the sky look? Clean _____ Hazy _____ Darker in some places than others? _____

3. Is there any smell in the air? _____ Where do you think it is coming from?

4. Take a peice of tissue. Wipe a car - look at it with a lens.
Wipe a window sill - look at it.
Wipe the bark of a tree growing near an intersection - look at it.
Go to a tree away from the road. Wipe a tissue on it. Is there any difference?

5. If there are stones or bricks on your school site, the teacher can sandpaper a small area. See if there is a difference in color.

6. If the school is near an intersection try watching the cars as they stop. Keep count of those cars, buses or trucks that have a great deal of exhaust. Notice the fumes. Try breathing at the light and then going on the school site where there are trees and no road. Try breathing again. If there were no trees would it be difficult to breath.

AIR QUALITY

1. Evaluating Air Pollution by Odor

Materials: Equal sized, covered, glass containers for each of the items. The following suggestions are possible examples: Onion, peanut butter, moth ball, perfume, aerosol hair spray, auto exhaust, vinegar.

CAUTION: In using the senses as a detector, you should always be extremely careful since the material may be toxic.

Procedure:

1. Rub a piece of the onion on the sides and lid of container and close.
2. Rub the peanut butter on the sides and lid of container and close.
3. Rub one drop of vinegar on the sides and lid of container.
4. Place moth ball in container for five minutes, remove, and close the lid.
5. Rub a drop of the perfume on the sides and lid of container and close.
6. Make one short squirt of aerosol hair spray into the container and close.
7. Capture auto exhaust by placing open container at exhaust pipe of running car and quickly closing lid.
8. One container with nothing in it as a control for comparison.
9. Number each container.
10. Guess what causes the odor in each numbered container. After everyone has smelled each container, discuss what they think it is. Is it pleasant or unpleasant? What can you do at home to get rid of an unpleasant smell? What is one way to tell if the air is polluted at home? Which smells are pleasant? Unpleasant? List them. Is this way adequate for all air pollutants?

AIR POLLUTION 5 & 6

1. **Air Pollution:** Collect and examine airborne particles.

Materials: A piece of cardboard approximately 12" square covered on one side with masking tape - sticky side up. A clear plastic film can be used to protect the sticky tape until you are ready to collect particles.

Procedure:

1. Place a tapeboard on an outside school window sill, facing the general direction of the wind and airborne particles.
2. Place a tapeboard on an inside school window sill.
3. Make tapeboards for the children to put inside their homes and bring back to school in a week.

4. Burn a newspaper or cardboard box outdoors when there is a slight breeze blowing. Place tapeboards about 4 to 6 feet upwind and downwind of the fire. Determine the difference in the amount of particulate matter collected on each. Observe smoke or its absence.

5. In each case, ask what they think will happen. Watch tapeboard each day for results. Where do the particles come from? What can be done to eliminate these particles? Why is there a difference by location?

AIR (Adapted from Pollution — Wentworth, Couchman, MacBean, Stecher Mine Publication, Incorporated

Particles which pollute the air may be grouped into three categories: solids, gases and aerosols. Solids may consist of small particles of dust, soil, soot or ash. These particles are placed in the air mainly by dust storms, wind, erosion, forest fires, and the incineration of garbage. They are eventually released from the air and are known as dustfall or fallout.

Gases such as sulphur dioxide and carbon monoxide are added to the air mostly by the burning of coal and oil in our furnaces, the smelting and refining of ores and natural gas by industries, and the incomplete burning of gasolines by automobiles and other vehicles. These gases usually remain in the air, and large amounts can build up over a long period of time.

Aerosols are solid or liquid particles which are mixed with gases and are usually too small to drop out of the air. The spray bombs used to combat insects and odours around the house contain some familiar types of aerosols. Such particles are also release into the air by a wide variety of industrial processes. There are a great many different types of aerosols.

Sometimes bad weather conditions, such as fog and winds, prevent these materials from being dispersed away into the atmosphere. When this occurs, smog is produced which in extreme cases results in illness and even in death.

Activity I:

What are some solid particles often found in air?

Obtain a piece of waxed paper 2 1/2 inches square. Use a pencil and ruler to mark the waxed paper so that it is divided into 1/2 inch squares. Attach the paper to a piece of board with thumbtacks. Smear the paper evenly with a coating of vaseline.

Select an open place in your backyard where the board and paper can remain undisturbed for a week or longer.

At the end of this time examine the materials which stick to the vaseline with a hand lens or a microscope. Choose one of the squares and count the number of different types of material that can be found in it. Count the number of each type in that square. Select other squares and compare the types and amounts of materials found in them. Organize this information into chart or graph form.

Digging Deeper

Which of the following types of particles may have stuck to the vaseline: dust, pollen, ash, spores, soil? What other materials did you find? Which was the most common type of material? Which types may have come from your house? Which types may have come from an industry? Which types would you normally expect to find in air? Which types may have been carried by wind? Did each square contain approximately the same amount of each type of material? What does the number of particles in a square indicate about the amount of air pollution in that location? Which type of material would be most harmful to your lungs?

Digging Deeper

Which of the following types of particles may have stuck to the vaseline: dust, pollen, ash, spores, soil? What other materials did you find? Which was the most common type of material? Which types may have come from your house? Which types may have come from an industry? Which types would you normally expect to find in air? Which types may have been carried by wind? Did each square contain approximately the same amount of each type of material? What does the number of particles in a square indicate about the amount of air pollution in that location? Which type of material would be most harmful to your lungs?

Branching Out

Examine the material which can be found on some furniture in your house which has not been dusted for a week or more. Also examine the material on the surface of an automobile parked outside that has not been moved or washed for a week or longer.

Compare the types and amounts of the materials found inside your house with the types and amounts found outside. Compare the material found on cars parked near a factory and cars parked in a residential area.

Activity 2:

What is the source of some of the solid particles in the air?

Prepare a dozen or more of the wax paper squares used in Activity 1 of this chapter. You could tape these collector papers onto pieces of cardboard instead of tacking them to a block of wood. Each piece of waxed paper should be smeared with a thin even coating of vaseline.

Place one collector paper out in the open on each of the north, south, east, and west sides of your home or school. Use a wind vane and compass to find the wind direction for each side. Use the compass to find the direction of chimneys, industries, well-travelled roads, construction sites, cultivated land or other factors which you suspect might be affecting the amount of solid particles in the air. Record this information as well as the wind direction and the location of your collector papers on a birds-eye view map of the area. Leave the collector papers outside undisturbed for at lease one day. Use a hand lens or microscope to examine the contents of two or three of the $\frac{1}{2}$ inch squares ruled on each piece of waxed paper. Count the types and the number of each type of material collected in each location. Record this information beside the appropriate collector paper location on your map.

Place a collector paper in each of several rooms in your home or school. Try to select rooms inwhich you think a variety of results could be obtained.

Care should be taken in selecting the spot inside the room where the paper is to be placed. A good location might be in the centre of the wall farthest from doors and windows, and 3 feet above the floor. After several days remove the collector papers and examine them. Compare the materials found on each paper.

What observations would you make if you placed several collector papers at various places in the same room?

Digging Deeper

On which side of your home or school was the greatest amount of solid particles found? From which direction did most of these particles come? What can be found in that direction that contributed to air pollution? How did the wind affect the type of solid particles collected? Why should the location of the collector papers be as identical as possible in each room? In which room was there the greatest amount of air pollution?

Which factors would help to account most for the amount of air pollution in a room: the number of people who use it; the closeness to the furnace; the ventilation system; what the people who use the room do in it, such as cook, sew, smoke; some other reason that you have discovered?

Branching Out

WHAT TYPE OF POLLUTION IS PRODUCED BY LOCAL BUSINESSES?

Select several local businesses such as a bakery, a gas station, a food store, and a machine shop. Ask your teacher to prepare a letter of introduction to the proprietor asking permission to carry out this activity and explaining what it is that you are going to do.

In each business you have chosen to investigate, tape a collector paper onto a carefully selected wall. One paper should be placed at the floor level and the others should be placed at 2 or 3 foot intervals above each

other to as high as you can safely reach. After one week, retrieve the collector papers and label them carefully as to their location and height. Examine each one with a hand lens or microscope. Determine the number and types of particles in one square of each collector paper. Put this information in a chart similar to the one shown.

In which business did you find the largest variety of materials stuck to the collector paper? Which business had the greatest amount of particles on the collector papers? Which business had the greatest amount of air pollution? Were more solid particles collected on the highest placed paper than on the lowest? At which height did air pollution seem to be the worst?

Height above floor	Bakery		Food store		Machine shop		Gas station	
	No.	Type	No.	Type	No.	Type	No.	Type
8'								
6'								
4'								
2'								
Floor level								
Totals								

WATER POLLUTION

We can live without many things, but not without air and water. This air and water must be pure. Water is a gift of nature that we have always taken for granted. It flowed through the earth and formed lakes and streams. Then as cities and towns began to grow, people's life became changed. Something frightening began to happen. Pure water became unpure. Poisons, seen and unseen, surrounded many communities. The waste created by people and animals and industry were buried or dumped into the water. If it was left on the ground, much of it was washed by heavy rains into the rivers and streams. As sewer systems were created, so were other problems. Now, waste that once was spread over a wide area was brought together and discharged into the waterways in a concentrated form. The poisons in this concentrated mass killed many living things in the rivers. It cut off oxygen from others. The water now could not be used for drinking or swimming, and the fish and other animals that lived in it would die. Detergents, thought to be an advantage over old types of soaps were widely used. The suds, however, did not disappear as soap bubbles did; they soon clogged up many streams. People using the edge of the stream or river would throw trash into the water. Oil and other trash came from boats. Many factories emptied their waste into the rivers. The rivers could no longer handle all the poisons and many of them "died", losing the life in them and making them unfit for use for water or recreation. This is water pollution.

A. Experiment - In Classroom - Detergent Suds

Use a bar of soap and some detergent; form each up and put one at a time into the sink. See what happens to the suds (time them).

Questions:

Which disappears first?
Why would suds hurt a plant? (Try watering a plant with sudsy water).
Why does it take so long for the detergent suds to disappear? (Chemical there as a cleaning agent).
How have we heard on TV about these detergents hurting something? (Ad on "hurt" hands - dish washing).

B. Study - In Classroom - Our Drinking Water

Start by placing water in glasses on a table, one from the tap, one from a stream in the community (preferably a muddy stream).
Which glass would you want to drink?

Questions for discussion:

Do we need water?
What happens if we run out of water?
What is the source of our community's drinking water?
Can we use the water in a lake, stream, or pond for water?
What are other sources of drinking water?
Describe how water is treated to make it safe for people to drink.

C. Is the Water We Drink Here PURE Water?

The class can be divided into committees to discuss these questions and report to the

class. A trip to a water treatment plant would be good reference.

How Pure is Drinking Water?

Put about 1/2 cup of regular tap water into a clean aluminum foil pan. Evaporate all of the water by heating the pan over a hot plate. Note the white minerals or scum that appear. Was the water pure? Repeat the same activity using distilled water. Discuss the differences. Display the pans showing the minerals present in drinking water compared to those present in the more pure distilled water.

D. Trip to a Polluted Body of Water

There are streams or rivers within walking distance of many schools; these may be used to study pollution.

Questions to be answered:

List signs of pollution

Natural Pollution	Man-made Pollutants
silt	sewage
acidity from swamps and bogs	trash
driftwood	driftwood
decomposed plant and animal matter	dead fish or animals
dissolved minerals	thermal changes - out of season (hot areas chemicals) (oil slicks, dyes)
	odors

*(Adapted from Water-Waste of Plenty, Raffo)

Pollutants in water often make a water more acid. This can be tested by dipping strips of litmus paper into the water. Try this both in a stream and in drinking water. If the paper turns blue, acid is present and possibly pollution is also present. This can be done in areas where the water LOOKS clean but may have pollution in it from further up the stream. (Litmus paper is available to Title I schools from the Outdoor Education Department.)

Back in the classroom some observations may be discussed:
Can the effect of man be detected?
What sign of man are not harmful to the water?
What simple steps might correct some ot the problems you have observed?

If the water is a stream, try to trace some of the pollution. (trash piles, factories or businesses, houses, etc.)

What can be done to stop these people or businesses from polluting the stream?
Laws? Enforcement of laws already in existance?
Pressure by the community?
What agency would a community go to in order to get help?
How would a private person report this?
How could the members of an elementary class help? (Pick up litter; try to talk to peers and neighborhood.)

(This is a good chance to discuss such things as pickets - What is good? Call attention

to the problem. What is bad? Can be overdone and lead to violence if tempers are allowed to flare up. The children have read about such things; they should be discussed pro and con.)

E. How Does Pollution Kill in a Stream? Does All Pollution Kill?

Use water from polluted stream if possible. If water from stream is not polluted, add chemical. Use silted (natural) and man-made with detergents. Put water plant into jars with both types of water. Watch the plant.

Why do directions for starting an aquarium or having goldfish always say do not use water directly from the tap for the fish? (Water has chemical in it to make it fit to drink.) Why would letting it stay in a jar for several days make it fit for the fish? What would the chemical do to the fish? Is this chemical like pollutants? (Fish must have oxygen.) The chemical takes the oxygen from water. Water that sits will pick up more oxygen from the air and allow the clorine in the water to evaporate.

F. In the Section on Erosion are Several Concepts that Fit with This Session. They May Be Used With Water Pollution Also.

G. Check the Water System for Your Community:

Is the water coming to us by way of well? Reservoir? Or River?
What must be done to it to make it fit to drink?
Does the water have a distinct taste?
How does this treated water get to your house?
What controls are put on the water by the city?
What disease can come from polluted water from wells? (typhoid fever)
Would rain water straight from the clouds be polluted?
Why did the Health Department suggest that you not eat snow last winter? (snow picked up pollutants in the air, brought them to earth)
How could the following materials help purify water? alum, sand, lime, chlorine, gravel, carbon.

H. Water Can Be Made Cleaner by the Filtering Process.

FILTERING WATER
WHAT DO WE WANT TO FIND OUT?
How can we filter dirt from water?

HOW CAN WE FIND OUT?
Half-fill a small funnel first with small gravel and cover with clean sand. Place the funnel in the mouth of a glass container, such as a quart mason jar. Pour muddy water slowly into the funnel and let it soak through the sand and gravel.

WHAT HAPPENS?
The sand particles "strained" the tiny dirt particles from the water. What does "strain" mean? Does it have any other meaning?

OTHER THINGS TO DO
1. When filtered the first time, the muddy water may be somewhat cloudy with very fine dirt particles. Pour the water through the sand the second time. What happened?

2. Keep filtering dirty water until you notice that the result is gradually becoming dirtier. Why does the filter not function indefinitely?

3. Try the experiment again, but with uncleaned sand. What happens? Why?

HAVE YOU OBSERVED. . .

. . . Other types of cistern filters made of charcoal, cement blocks, or unglazed bricks? How could these materials filter water?

. . . Our well water is filtered by nature's filters: soil, sand, and gravel as it soaks down to the underground water table? What is the water table?

. . . That as water is absorbed through the earth's crust it dissolves many minerals, resulting in the "hard water" we obtain from wells? Why isn't cistern water "hard?" What does "hard" mean here? Is there also "soft" water"?

MISCONCEPTION?

Caution children that filtered cistern water is not necessarily bacteria-free and suitable for drinking. Consider that the types of dirt, soot, and even bird-droppings that could drain into a cistern.

MATERIALS:

Funnel, mason jar, clean sand, uncleaned sand, muddy water.

I. Another Method to Clean "Muddy Water"

INTERMEDIATE LEVEL ACTIVITIES

Half-fill a clean liquid duplicator can with muddy water (Can A) and place it on a hot plate or over a Bunsen Burner to boil. Fill Can B with crushed ice, snow or very cold water. Hold or support Can B in the position as shown, with a glass jar below the lower edge to catch the water as it drops. The muddy water will boil, causing the water to evaporate, thus leaving mud in Can A. The coldness of Can B will cause the water vapor from Can A to condense on the surface as pure distilled water. As more vapor condenses, the droplets of water will collect and drop off into the collecting jar. Compare and discuss the differences in the appearances and properties of the muddy water left in Can A with pure collected water in the jar. The collected water could be evaporated from a clean aluminum foil pan and compared with the results of Activity 75, HOW PURE IS DRINKING WATER? (Note: The muddy water has been distilled.)

J. Keeping up With Problems:

Have children clip from newspapers any reference to a problem with waste materials; fish killed in river, oil in stream that caught fire, recent exposion of sewage plant that made raw sewage put in sewage, oil on oceans that killed birds, etc.

Why would oysters in polluted waters spread disease?

FILTERING WATER

WATER POLLUTION 1-4 grades

Main Purpose: The awareness and appreciation of ...

1. Water Pollution (Using your senses to evaluate)

Materials: One quart of:

a. City water fresth from the tap
b. City water after setting for twenty-four hours
c. Well water
d. Stream or ditch water*
e. Rain water collected in a container setting out in the open
f. Rain water off a roof*
g. Dilute vinegar
h. Dilute NaOH (caustic) solution (one pellet per quart)

Procedure: Before you start, show them how to taste the water by sipping from a paper cup and not swallowing it. Let them see, smell, feel and taste each sample, describe it. Make up a chart for them to fill in. See example below:

*DO NOT TASTE d, STREAM OR DITCH WATER, OR f, RAIN WATER OFF A ROOF.

Sample No.:	a. Yes No	b. Yes No	c. Yes No	d. Yes No	e. Yes No	f. Yes No	g. Yes No
Does it look good?							
Does it feel good?							
Does it smell good?							
Does it taste good?				DO NOT TASTE		DO NOT TASTE	

©1971, Courtesy of The Dow Chemical Company
Permission is granted for schools and governmental agencies to reproduce this paper in its entirety for educational purposes providing the above copyright notice is shown.

Conclusions: Which sample looks, smells, feels and tastes best? Which is best for drinking? Which is worst? Then explain what each sample was and how it can be improved by treatment. The vinegar (acid) feels "squeaky." Bases are slippery. If it isn't either, it is generally neutral.

2. Water Pollution (Using your senses to evaluate)

Materials: One quart of soapy water (dish water) and one quart of tap water.

Procedure: Note the appearance and odor of both samples at the start. Put in a quiet area out of the sun. Let the students guess what will happen to each sample in an hour and by the next morning. Then note the appearance and odor of each sample at the suggested time intervals.

Conclusions: Did they guess right? Has anything settled out? What does this mean to the whole community? Do they think dish water is good for people to drink?

3. Water Pollution Treatment (Using your senses to evaluate)

Materials: The above samples of soapy dish water and tap water, filter paper or paper towels, funnel, aerator from a fish aquarium, and an empty container for each sample.

Procedure: Pour water into separate containers through the filter shaped into the funnel. Put the aerator tube into this filtered water for one hour; 24 hours. Note any change in appearance, odor or taste. Let the children make predictions before and after each step.

Conclusions: What are their conclusions about the effects of settling, filtration, and aeration on the appearance, odor, and taste of the water?

4. Soil Management and Its Contribution to Water Pollution (Using your senses to evaluate)

Materials: Two pie tins, tin can with perforated bottom, enough soil to fill two pie tins evenly, grass seed, and two containers to catch runoff water.

Procedure: 1. Sprinkle grass seed on one pie tin with the soil in it, press the seed into the soil, and moisten well. Place in sunlight and water twice daily. Let it grow for approximately two-three weeks.

Note: Step 1 is a separate project, which can be used with the following experiment. As an alternate to Step 1, a piece of sod about the size of the pie tin can be used instead.

2. Set pie tins (one with soil and grass and the other with soil alone) on a slant on the edge of a table with the catch basins on the floor under them. Sprinkle equal amounts of water on the two pie tins. Compare the amount of soil in each catch basin.

Conclusions: Put the water into an aquarium with fish. What happens? Will hamsters drink the water? Would the children drink the water? Have someone take dictation from those who cannot write their story. What can people do to prevent this runnoff?

3. Conduct a field trip to locate some barren spots and to plant grass seed or other vegetation. Go back periodically to check the effectiveness of the seeding in controlling erosion. The project, when completed, may be newsworthy for the school or local newspaper.

WATER POLLUTION 5 & 6 grades

Main Purpose: Extending the awareness, developing measuring tools and experimentation...

1. Water Pollution: Examine and measure two or three water samples to define suspended and dissolved matter. A field trip to collect samples of water from local sources is suggested. Note evidences of pollution, such as floating matter, appearance and odor.

©1971, Courtesy of The Dow Chemical Company

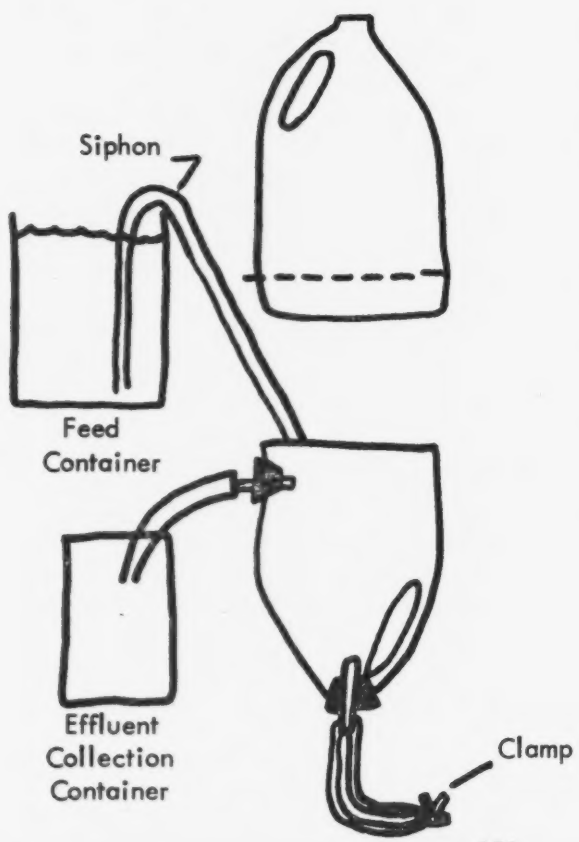
Permission is granted for schools and governmental agencies to reproduce this paper in its entirety for educational purposes providing the above copyright notice is shown.

Materials: Samples of water, about one gallon each of river water, drinking water, well water and rain water. Filter paper and funnels. Beaker or other vessel suitable for evaporation of the water. Balance for weighing residues on filter paper and in beakers.

Procedure:
1. Divide water samples into measured portions for each group of students for which a set of materials is available.
2. Weigh the filter paper and beaker; filter water sample through the weighed paper; dry and re-weigh paper.
3. Collect and evaporate filtered water in weighed beaker by whatever means are available; re-weigh the beaker.
4. Note and evaluate the residue weights and how they relate to the purity of the water.

Conclusions: What conclusions can be reached regarding which water would be best for drinking? What other uses of this water might be suitable?

2. Waste Pollution Treatment: Construct and operate a clarifier which is used to remove suspended solids by settling (sedimentation).



Materials: For each demonstration unit

Plastic bleach bottle (one gallon)
Two rubber stoppers (to fit openings)
Rubber tubing 4-6 ft.
Razor blade
Glass tubing - two short pieces
Waste storage container
Treated waste storage container
Water
Few handfuls of dirt (soil)
Assorted cork borers
Tubing clamps
Ring stand
Clamps or rings

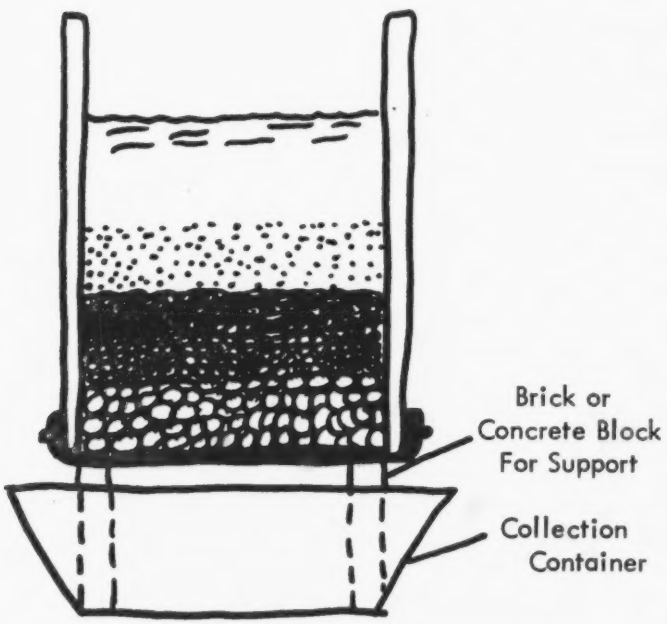
Procedure: 1. Cut and fit bottle as indicated in the drawing. Bore holes through bottle and rubber stoppers. Fit stoppers and glass tubing into bored holes and the bottle opening.

2. Connect rubber tubing to glass fittings. Fill waste storage container with water and add dirt. Mix thoroughly. Establish siphon feed to clarifier and effluent tube to the treated waste storage container.

3. Compare waste water in the clarifier with the overflow or treated effluent. Remove clamp from bottom tubing and collect the matter which hopefully flows out. It may plug with dirt off the bottom. Filter effluent.

Conclusions: Compare the influent quality with the effluent quality visually. Is there any improvement in clarity? Does this appear to be adequate treatment for drinking water? For any other use.

3. Waste Treatment: Explore the effects of "percolation", as a water treatment method, by constructing a classroom model. "Percolation" is a natural process by which water is filtered several times by various soils in its passage from the surface to the water table.



Materials:

Metal, glass or plastic cylinder about 12" to 24" long and about 6" or greater diameter. Wire or plastic window screen, about 1' square (to cover one end of the cylinder). Two to three feet of bendable wire (stove pipe wire) to fasten screen to end of cylinder. Coarse gravel, pea gravel, coarse sand and fine sand sufficient for about two-four inches of depth for each in the cylinder. About one gallon of a dirty water (dishwater).

Procedure: 1. Fasten window screen securely over one end of the cylinder with the wire.

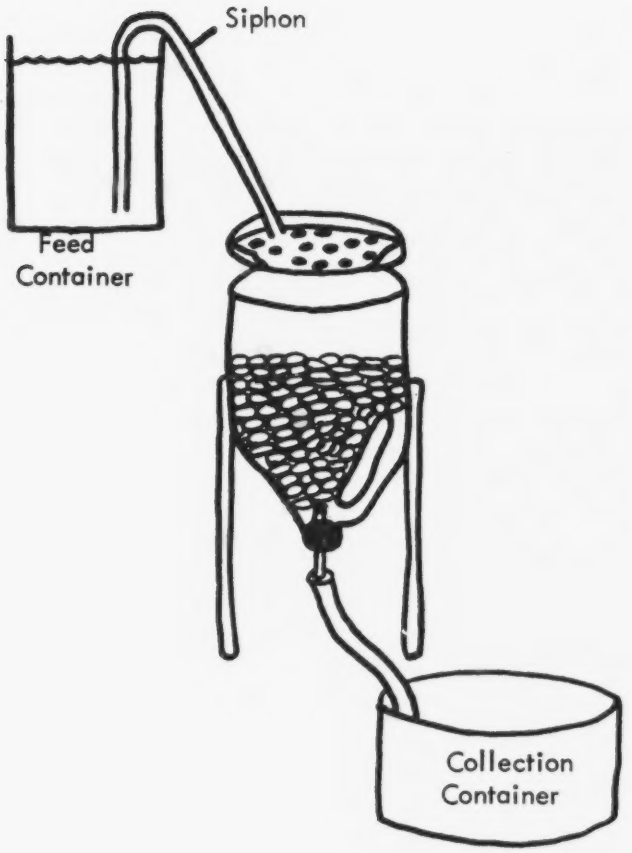
2. Add layers of gravel and sand from the more coarse to the finest.

3. Place a collection container under the cylinder and pour the dirty water into the top of the cylinder.

4. Collect water for examination as to clarity and appearance.

Conclusions: Is there any apparent improvement in water quality? Is this an adequate treatment method for drinking water? For other uses?

4. Waste Treatment: Explore the effects of biological trickling filter as a waste treatment method by constructing a working model. A "biological trickling filter" is a natural process by which bacteria take pollutants from the waste, and oxygen from the air, to oxidize these materials to carbon dioxide and water.



Materials:

1 gallon plastic bleach bottle, crushed rock (enough to nearly fill the bottle), containers for waste to feed the trickling filter and to catch the effluent. The containers should be big enough to hold about one day's flow over the filter. Rubber tubing 2-3 ft. long. Tubing clamp.

Procedure: 1. Cut bottom off the bottle about one inch from the bottom. With a nail punch holes in the bottom in such a manner as to distribute them evenly over the bottom surface but not closer than 1/2 inch to the outside edge.

2. Invert bottle, place in a holder, fill with the crushed rock almost to the top.

3. Place effluent container under the bottle opening.

4. Establish a siphon from the waste feed container to the inverted bottom of the bottle (on top of the inverted bottle). Continue flow of waste water by recycling until a growth of bacteria (slime) is noted on the rocks, and the apparent quality (clarity and odor) of the effluent is good.

Example:

Data Sheet

Effluent Qualities

Date	Clarity	Odor	Litmus (pH)	Observer

Conclusions: Did the bacteria grow from the food in the waste? Is there any apparent improvement in the water quality? Do you think this method would be adequate treatment for drinking water? For other uses?

Water Pollution

In classroom activities

Take some lawn fertilizer or plant food. Put different amounts of fertilizer in jars of water. Add some water plants and a few snails to each jar. Set them in a sunny window and watch what happens. Use a "control" jar without fertilizer. This will show how run-off of garden and farm fertilizer will cause algae to over-grow and use up all of the oxygen. This will take the oxygen from the fish and other animals.

Other Related Activities:

Have different groups of children look up effects of water pollution. Have a panel discussion about the problem with a student or teacher moderator. Ask the rest of the class or other classes to ask questions. Make book marks in the shape of fish. Write on each "I Hate Water Pollution". Give out at PTA meeting.

Draw a mural showing where the water comes from and how we get water. Have a key showing how wa ter is used for enjoyment as well as our use. Show what might happen if factories and houses were built on the side of a river and poured their waste into the river.

As k a member of the staff of the Water Quality board in the city or state to show the children how water is tested. Have the children write creative stories. They can imagine they are a single rain drop. They can then write about their travels and what happens to them.

Start a campaign in the schools and at home to conserve water. Don't let the water run the entire time while you are brushing your teeth. Watch for dripping faucets at home and at school. When washing your hands use a little water, add soap, turn off the water while you rub your hands, then back on again to rinse them off. Let the children think of other ways to save water and make posters suggesting these ways.

OTHER THINGS TO DO:

Make posters on Clean Water.
Write letters to the Governor about a problem in your community.
List ten ways you use water in your home.
Measure to see how many gallons of water it takes to fill your bath tub.
Allow a small amount of tap water to stand in a glass until the water evaporates. Is there a white ring left on the glass? Where did it come from?
Get material from the state and city water pollution office; give it to parents and neighbors.
Draw a picture of a water treatment plant and how it works.
Try filtering out clean water with a cloth or gravel or carbon as is done in a plant.

WASTE POLLUTION

Our nation has more litter than any country in the world. One of the main problems in our country has always been waste. We have developed a large amount of goods for everyone and have placed the emphasis on packages and containers, no-deposit bottles and cans. Without any ideas or methods for re-using most of this, the result has been more waste. Billions are spent each year just to pick up trash. This is one area where every child can help. If they can be taught to take care of the land and not litter, a great step will be taken to help solve this problem.

It cost $.35 in taxes to pick up a pop bottle, candy wrapper, or other similar item discarded along our highways and in our parks. Take a walk with the class around the school grounds or a nearby park, picking up bottles and papers, and putting them in trash cans. Have someone keep a record of the items picked up. How much did the class save the taxpayers?

You can make a math lesson out of the fact that one American is responsible for one ton of garbage per year. How many pounds is that per person each day? What happens to all that garbage?

Activities:

A. Make a litter survey on the school site (different classes can take different spots. If there are some very bad areas NEAR the school, such as a vacant lot, etc., this should be included Once the survey has been completed, it can be used as a projection of other areas, that is, if an area this size has this amount of litter, figure out what the entire block might have. A sample litter survey is below. The litter should be collected; many things can be done with it. This should be discussed with the children:

1. Should it be burned? (No, puts pollution into the air)
2. If we put it into the dumpster, where does it go? (check this out)
3. Could any part of it be used over again? (paper made back into pulp, metal remelted?)
4. What could we do with it? (pop art might be made with some; if there are plastic bottles, there are many ideas (list from Outdoor Education Department); pieces of plastic cut to make mosaic; scrap wood and other materials can be used in crafts; paper that might not be too bad can be made into papier mache.

Let the children come up with some ideas, both for this litter and for the problem of litter.

Questions:

What could be done to stop people throwing away cans and bottles? (put a higher deposit on them; re-use metal in cans; do away with no-deposit bottles; Companies have contest or campaign to get back cans or bottles)

What other benefits other than re-use of waste would there be in turning the scrap paper back to pulp? (Less trees would need to be cut down for pulp, more into lumber)

What could glass bottles be used for? (there is an experiment now being tried that crushes the glass up and uses it for the bottom layer of highways instead of gravel)

Could the glass be remelted?

Is there any use for scrap plastic? (?)

Why can't scrap metal be reused? (It could, but so far most companies feel it is too expensive to get the machinery necessary.)

WASTE POLLUTION

1. Ask children to keep an eye open for litter on their way home and give a report to the class the next day. Teacher can check the location to see if it warrants showing the whole class. If so, walk the class there and pick up all litter on the way and at the spot. Put it in a garbage bag. Point out how nice the spot looks now.

2. In the classroom, examine collection and list kinds of litter. How did it get there? What can the children do to keep it clean? What can they suggest that others do?

3. Have each child look in his or her desk and around room. Are these areas free of litter?

4. Burn a cotton rag, a piece of string, a piece of paper and a peanut butter sandwich over an aluminum pie tin. Hold with a pair of pliers. Keep children at a safe distance. Is the smell pleasant? Have the children noticed anyone burning anything in their neighborhood? Does it look or smell good? (Tell mom and dad that it smells and looks bad, and it is usually against the law.)

5. Have each child look around home and see what they can do to get rid of litter. (Old cloths, rags, papers, messy garbage cans, own bedroom, toys untidy, etc.). In class, let each child tell what he did that day to make his "world" a cleaner place to live.

6. Draw pictures of areas before and after cleanup. Write a poem or story to go along with the picture. Have upper class students take dictation and make final copy for them if they cannot write. Publish in school newspaper or publish a class booklet. Share it with other schools so they can get involved. Maybe the class would like to volunteer to keep a certain section of playground clean.

7. Have children list or tell you about the kinds of solid waste litter. Who causes it? What can be done? (This is a means of final evaluation.)

SOLID WASTES & LITTER 5 & 6 grades Activities

Materials: Have students bring from home or neighbors' household appliances that do not work for one reason or another. Can openers, electric irons, toasters, etc.

Procedure: In groups of two to four disassemble an appliance or examine it carefully to try and determine what is not functioning properly and why. This disassembly should be done with the firm understanding that the appliances are to be reassembled even if it is is impossible to repair.

Conclusions: Evaluate what would be needed to put the appliance in working order, even if the part is not available or service cannot be done in the laboratory (classroom). Can parts from one appliance (toaster) be used on another (toaster)? If not, why not? Discuss the benefits and disadvantages of the ability to interchange parts. Have students determine availability, information and prices by writing manufacturer, or distributor whether repair is intended or not.

WASTE POLLUTION

Activities:

8. Establish a classroom rule that the wastebasket will not be used for one week. (Get permission from the custodian and principal.) Make a tall wire container to hold the waste. Discuss the results.
9. Keep a week's record of litter thrown out at home. If possible weigh it. How does your family compare with the average citizen who disposes of almost a ton of refuse every year? Which item was thrown out the most? Would there be any way to reuse this item?
10. Find a vacant lot or heavily littered area. Try to find out what item is thrown away most often. This can be done with a random sampling. Make a circle with a coat hanger. Toss the coat hanger circle 20 times. Record types of litter found in each circle. This will give a good sampling.
11. Compare the cost of returnable and throw-away bottles. Which are cheaper to buy? Why?
12. Ask someone to visit and tell how garbage is disposed of in your community. Discuss advantages and disadvantages of each method. Open burning, incineration, sanitary landfill. Discuss each in reference to air pollution (burning and odors), water pollution (dumping and burying), and land pollution (accumulation of non-degradables.)
13. Make a chart with the children, listing types of litter- glass, paper, plastic bags, cans, bottles, metal fragments, strings, other materials. Ask them with their parent's permission, to stand for about 20 minutes near a store, restaurant or service station and tally the litter dropped or thrown by adults (either walking or riding in a car). List children on a separate page. Notice if there is a trash container around.
14. Plan and give the principal ideas for improving the school ground. Such a plan might include a suggestion that different students be given jobs cleaning up the area- some to plant flowers and trees. A list may be made of cracks and holes in the school grounds and streets, and these brought to the attention of the proper people. Trash cans can be made and painted to be put on the school grounds. If the large type cans are used a nearb junk yard might give "odd" shaped metal pieces that can be welded (get a parent) to the top of the can to make it look like an animal. It can then be painted and a sign "Feed Me" put on the opening. A special effort can be made to cut down on the litter inside the classroom and a large Litter Monster can be made of wire to hold litter found outside the school. A movie, "The Litter Monster," is available from the Keep America Beautiful Association.

B. What about the waste taken from the school and all garbage cans, etc. each day? (Some garbage could be turned into fertilizer for crops. A German city and one U.S. city are now using special machinery that uses all forms of trash and waste as power - even the smoke is used, but the machinery is expensive to install.

Let the children "brain storm" on this; they might come up with some good answers; record all of them. Bring out that in the long run, it would be better to find a method to use the waste (such as the power plant) than to allow the waste to pile up.

C. Discuss the litter problem in relation to the school. Have the children look around them; check the waste basket. Need all the BE litter? Don't we waste a lot because we have so much? Isn't this a place for conservation - in materials, in equipment, etc.? Have each child try to conserve his paper, pencils, crayons, etc. for a short period of time. Discuss what this could mean in money - a little bit to them but if everyone did it, a great deal would be saved.

Discuss containers, why our nation seems to have to have fancy boxes, etc. Does this really make the product better? How could we cut down the cost of the waste by using fewer containers? Would this cut down the cost of the item? (They can check this out by comparing a new item in the store; does the special box for the "new potatoe chip" contain the same amount as a bag?

D. Organize a Litter Police. At a certain time each day allow the members to go out and collect the litter from the school yard. Make it important with a badge, sack, etc. - an hour.

E. Make posters about litter.

F. Write letters to some of the soft drink companies urging them to stop putting out no-deposit bottles and asking that cans be redeemed also. It is never too early to help the children understand their voices can help in a campaign if done correctly.

If the children have come up with some original ideas on how to use bottle tops or cans, send these ideas to the companies also. If your school has a kiln, broken glass can be used as glaze in the bottom of a bowl, etc.

Use the big plastic garbage bags to gather the litter. Watch for the broken glass and instruct the children in how to handle it and any sharp items. If they have a doubt, have them come to you.

G. Concept: It is the responsibility of every adult and child to dispose of trash in a suitable way, in order to prevent litter-bugging and to keep American beautiful.

Problem: Is it possible to tell from the kinds of trash deposited on the sidewalks and streets on the way to and from the school the ages of the litterbugs.

Materials: Large paper shopping bags.

Procedure: The children fill their paper bags with the refuse found on their way to and from school and the teacher lists on the chalk board the amounts and kinds of materials contributed by each child. The things that are tossed aside by adults as well as by children should indicate that litter-bugging is not restricted to any particular age group.

Explanation: Litter bugging has become a national problem, which should be considered both in terms of what can be done about the disposal of trash and how the removal of the debris affects the tax dollars which parent must pay.

SAMPLE LITTER CHART

Area _____ Where Found _____

Plastic

1 piece of bottle
3 coffee cups
1 meat tray, etc.
9 plastic bags

Cans

5 beer
8 pop
3 juice

Paper

newspaper
2 cardboard boxes
9 flyers
4 labels

Other Glass

23 parts of bottles and jars
7 pieces of window glass

Bottles

(no-deposit)
8 Pop
10 beer
3 salad dressing
(deposit)
10 Pop (use money for treat)
2 beer

Bottle tops

15 tabs from cans
25 tops

Metal

1 hub cap
3 broken tools
4 parts of window
11 nails
broken toy

Other

broken crayons
old rags
piece of car tire

Categories can be added as children find different things. If the material is gathered and then separated into piles, it can more easily be counted and some idea of what could be done with it be made.

To make this a meaningful experience the children must understand that they have a job to do in NOT LITTERING THEMSELVES.

Room Litter Activity (Good for Lower Grades):

Materials: Scotch tape, (strip for each child) piece of white paper (for each child), something to scrape particles from tape to paper.

Have each child put the strip of tape on the floor, sticky side down, beside his piece of white paper. Look at what is there.

Questions:

What is on the paper? Where might it have come from? (dirt, hairs, lint, etc.)
Why might even this be bad for us? (dirt might bring in germs, dust get into our lungs)
What can we do to help keep the room cleaner? (Scrape shoes before coming in, keep floor swept.
If window is open can things blow in? Will this bother us? (Smells, smoke, etc. can be bad. Some smells are good if the air is clean.
How can inside air be made cleaner? Air conditioners and filters help.

Check Room: A spot check. To see what is litter. Paper on floor, crayons, etc.

Questions:

Why is paper on the floor bad? (Looks bad, waste paper, figure out cost of the "waste" paper found on the floor for a week.
Wouldn't it be better to save this paper and spend this money on something else?
How can we help to save and conserve--crayons, paper, soap, etc.? Use only what you need and try not to make mistakes on the papers you write on. In the restroom use only one towel. (This can be used to teach the proper use of towels, soap, tailet paper, etc.)

Taken from Article in Grade Teacher by Herbet Kohl

HOUSEHOLD WISDOM

We have not been very wise with respect to the care of our earth household. Man produces more than he consumes and accumulates waste products that poison his environment and which may eventually destroy life.

The classroom is an ideal place for the young to begin to learn about the care of the environment. It is possible to study ecology in a formal way. It is also possible to live it.

One way to begin is to survey the waste that accumulates in the classroom during the course of a day or week and see how much of it can be used instead of dumped.

In the classroom there are usually a number of organic waste products such as chewing gum, candy, banana peels, apple rinds and bread crumbs. These products are usually dumped into the same can as nonorganic wastes like paper, old pencils, plastic pens, used notebooks, etc. Yet these two categories of waste products cannot be disposed of in the same way. The organic waste, in fact, can be used very profitably if one has a small gardening plot in the school, for they can be used to create a compost heap that will develop fertilizer for the garden. In fact, two waste baskets--one marked organic and one nonorganic--can be the beginning of wise housekeeping in the classroom.

There is a lot that can be done with nonorganic waste. Old papers can be used to make papier-mache or worked into collages and paintings. They can be used as note scraps, as towels, as wrappings for packages. Pencil stubs can be broken apart and the wood used as small constructions while the lead can be accumulated and used in mechanical pencils. The parts of plastic pens can also be used in many ways. The springs can be used for scientific experimentation, the cartridges for collages and constructions that can decorate the room. I have seen, for example, a wall constructed out of old ball-point pens glued together. The wall is constantly added to as new waste develops and is very functional in the classroom as a divider to make private spaces.

One need not confine the class to studying ways of using waste products in the classroom alone. In our school we have a class in automotive mechanics. The class has spent a lot of time going to junkyards and empty lots where the students have found old engines and carburetors and gear boxes. They have also learned how to make their own tools out of discarded scraps of metal and wood. With a soldering iron, a hack saw and a few other tools, students can make hammers, screwdrivers, drills, etc. In this way, they can see the transformation of waste products into useful objects.

Useful Waste

There are a lot of other wastes that can be collected and reused in the schools. Old clothes can be used for costumes, or remade into new clothes. Advertisements, old posters and discarded billboard sections make wonderful reading material and decorations. Last year I found a "sign graveyard" near our school. A large lot was filled with old signs. There were 10-foot-tall letters, large soda bottles and such. We asked for some of the signs for our school and were given them. The letters and figures were worked into a fantasy playground. Other letters and figures were taken apart and the wood and metal were used for other purposes.

We found that mattress factories have more scraps than they can sensibly dispose of, and so we used them to stuff animals and to weave large tapestries.

In a modest way students can help to develop ways of managing our earth household more wisely. They can be told about the interrelationships of various forms of life and can study life systems. But they can also begin to act upon their own to waste less and want less. They can use their ingenuity in developing new uses for old things and find ways of making our environment less cluttered. Perhaps they can even influence their parents to care more about the way in which they use or discard objects.

LITTER (Adapted from Pollution — Wentworth, Couchman, MacBean, Stecher Mine Publication, Incorporated

Digging Deeper

Use your graph to assist you in answering some of these questions. How many types of litter did you find? Which was the most common type? How many more pieces of the most common type were there than pieces of the rarest type of litter?

In what ways could another person's graph of this activity be different from yours? What reasons can you suggest that might account for these differences? How do you think the graph made by a person who lived on a farm might differ from one made by a person living in the city?

If you were attempting to explain the meaning of the word litter to a friend, what would you tell him? How do you think that litter is different from garbage? What types of litter are health hazards because they could encourage diseases or cause accidents?

Which types of litter reduce the beauty of the area?

If you collected exactly 100 pieces of litter and found that there were 7 candy wrappers this would mean that 7 percent of your litter was candy wrappers. If 23 pieces of the litter were facial tissues what percent of the litter is facial tissue? Try to express in percent the amounts of each type of litter in your collection.

Each day many tons of tiny particles of iron and nickel from meteorites shower down upon the earth. This material can form as much as one-tenth of the debris on the ground. Could this be called pollution from outer space?

Branching Out

WHAT TYPES OF LITTER WILL A MAGNET COLLECT?

Obtain a strong magnet from your school or from an old radio speaker. Tie the magnet to a length of string. Tow the magnet along the ground at the edges of a sidewalk or some other interesting place you would like to test, such as sand. Examine the magnet after short regular intervals and carefully place anything which sticks to the magnet into a plastic bag. When you feel that you have done enough collecting, try to separate the material into three piles: newer objects, older objects, very old objects. Place the objects in each pile into one of the three plastic bags.

Of what materials were the objects that were collected made? In what other ways could your collection have been grouped? What differences in materials collected would you find if you towed the magnet at a distance of 3 feet and a distance of 6 feet from the edge of the sidewalk?

What is a Collage?

Consult a dictionary or ask your teacher in order to find the meaning of this word. How could you use the more interesting pieces of the litter you collected to make a collage?

Activity 2

Where is litter found?

Revisit several of the areas in which you found litter while making your collection for Activity 1. Look for other places in which litter may be found. Compile a list of all the areas in which you can find quantities of litter. Your list might include: your own backyard, an alley near your house, the lockers in your school, under your bed, along sidewalks and paths, along fences, around a home that is being built, in the gutter at the sides of the road, a nearby confectionery or drive-in food store.

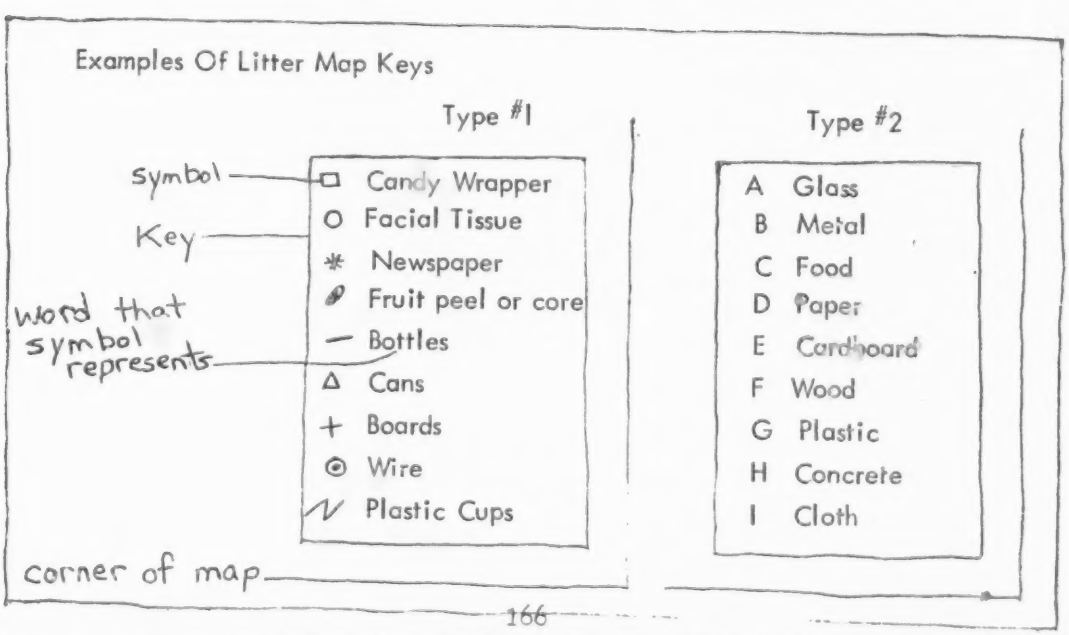
Select two or three of the more interesting areas that you listed. These areas should have a large amount of litter in them. Imagine yourself to be flying above each area, and make a map of what you would see if you looked downward. Your map should show the location of walls of buildings, fences, sidewalks, trees and bushes, etc.

If the area you are mapping is indoors, your drawing could show rooms, hallways, doorways or lockers as they would appear if the roof of the building were removed.

Use a compass tolocate the direction north. To do this, place your compass on a flat, level surface far away from any objects made of iron or steel. Turn the compass until the north end of the needle points to the letter N on the dial. This is called orienting your compass. Turn your map so that the lines you have drawn match the direction of the real walls, fences, and other details. Now draw an arrow on your map which matches the direction in which the compass needle is pointing. Map makers prefer to draw their maps so that the top of the map can be north.

Select symbols or letters to represent the types of litter collected in the previous activity. In one corner of your map make a key which shows the letter or symbol and the type of litter for which each symbol stands.

Take your map with you to the area which it represents. Look for litter but do not collect it this time. Instead, place the symbol in the proper location on your map for each type of litter you find.



Digging Deeper

Use the data marked on your maps to assist you in answering several of the following questions. What was the most common type of litter found in each area? What types of litter are found only in one particular area? Near what objects were the largest amounts of litter found? Near what objects were the largest amounts of litter found? Which areas, such as paths, on each map are the most used by people? Does the location of litter provide some answer as to the direction from which the wind blows most frequently? How could a weather vane and compass be used to determine this direction?

Where would be the best place to locate trash cans or posters about littering? How would the type or amount of litter change before and after a garbage collection day, before and after a weekend, in the spring and in the fall, before and after a storm, before and after a football game or other well attended sports event?

What place is most polluted by litter in your area?

Activity 3:

Who are the litterbugs?

Use the information which you have discovered in Activity 2 to help you decide upon two or three locations to observe. These locations should be places where litter can easily be found and where people continually come and go.

You might choose to watch the schoolyard, a street corner, a local store or perhaps a bus stop. Choose carefully the time at which to make your survey so that as many people as possible can be observed.

When children are coming or going to school or playing at recess, or when adults are travelling to or returning from work might be the best time for you to be watching.

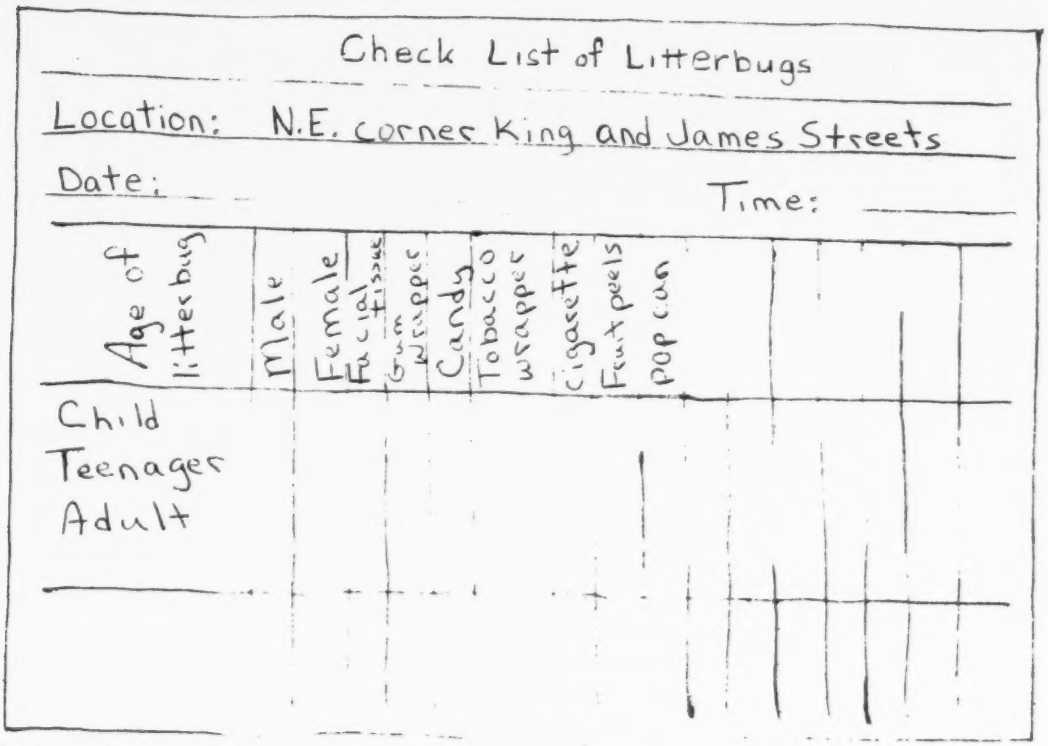
Plan and prepare a check list that you could take with you and use to help record your observations. Some of the details that you might record are whether the litterbug was a child, teenager, or adult; what type of litter was dropped; at what time it was dropped; whether the litterbug was a male or female; in which direction he was travelling, and so on. You may wish to revisit the area at the same time for several days in order to gather enough data. To help you reach some conclusions, total the number of check marks in each box of your chart and add up the number in each column.

Repeat your survey on a number of days to find if the data you have collected remains fairly constant.

Digging Deeper

Use your check lists to help answer the following questions. How many people were litterbugs? Which age group had more litterbugs? Who causes most of the litter pollution in your area? Are teenagers more like adults or are they more like children in the type of littering they do? Do the females in the area do more littering than the males? What was the most common type of litter dropped by children? What differences

in litter patterns would you find if you conducted your survey on a Saturday and then again on a Monday?



Activity 3:

What kinds of buried garbage will take the longest to disappear?

Line the inside of a cardboard carton with the plastic from a green garbage bag to make it waterproof. Place 3 to 4 inches of soil dug from the garden into the bottom of the box. Collect samples of as many different types of materials as you can. Your collection might include: wood, rubber, newspaper, waxed paper, food wrapping, cardboard, brown paper, copper (a penny), iron (a nail), aluminum, styrofoam, soft plastic, hard plastic, nylon, cotton wool, and so on.

Cut or tear four pieces, of approximately equal size, from each material. All the pieces used in this experiment should be about the same size. Bury three pieces of each material in rows in the soil. Tape the fourth piece to the side of the box to mark the location of the row. Water the soil each day to keep it moist but not soaking wet. Wait for one week, then remove one of the pieces of each type of material. Compare these pieces with those taped to the side of the box and record any changes in the materials that you can observe. At the end of the second week remove and compare the second piece of each type of material. Remove the third piece at the end of the third week.

Select the method that you feel would be best suited to record the information which you have observed. You might consider the merits of a chart, a descriptive paragraph, a graph, or a series of diagrams, before reaching your decision.

Digging Deeper

Which type of material had changed the most after one week? Which types of

materials were just beginning to change after three weeks? Which materials had not changed at all? Which materials showed signs that they were disappearing? Which materials do you suspect might require a year or more to completely disappear? Which materials do you think might not disappear for a hundred years or longer? Which materials do you feel would be the least suitable in which to wrap or bury garbage? Which type of material would contribute most to pollution?

Branching Out

WHICH TYPE OF TOILET TISSUE BREAKS UP AND DISAPPEARS BEST?

Obtain as many brands or varieties of toilet tissue as you can. In addition to the types made by various companies and sold in stores, your collection might include types often found in the washrooms of large commercial buildings. Instead of using toilet tissue, a variety of facial tissues or paper towels could be substituted.

Cut or tear two pieces from each type of toilet tissue. Every piece should be approximately the same size. Collect as many wide-mouthed glass jars (of the same size and type) with lids as the number of types of toilet tissue you have. Place a different type of toilet tissue in each jar. Tape one piece to the outside so that you know which type of paper is in the jar.

Put the lids on, and shake each jar back and forth in exactly the same way twenty times. Compare the paper inside the jar with the sample taped to the outside.

Allow the jars to rest undisturbed for one week, then shake them again in the same manner and make more comparisons. Why was the size of the jar, the size of the paper, the amount of water, and the number of shakes always kept the same? Which brand of toilet tissue had disappeared the most? Which brand had changed the most? Which brand had changed the least? Which brand would you consider to contribute most to pollution? Why? What does the term biodegradability mean?

NOISE POLLUTION

Noise is any unwanted sound. Some sounds are noise to one person, but not to another. Today's band music may seem to be terrible to older people but may be the right "sound" for young people. Some noise can get on people's nerves, like the drip of a faucet at night. The pitch and duration of a sound makes a great deal of difference. High pitched noises may bother others. A steady hum will get on some people's nerves but not bother others.

Noise is everywhere. Some we get used to because we hear it all of the time. Many peopld going to the country for a vacation can't sleep at first because of the crickets and frogs. People trying to sleep near the ocean for the first time have trouble getting used to it. Noise can cause accidents and harm the body. Sound, also, provides us with information about changes in our surroundings. When we hear the clothes dryer stop we know to go take the clothers out. The hiss of steam may tell us the room will soon be warm. The sirens going tell us to get our car out of the way. All of these things are a form of communication.

It is difficult to always tell the difference between sound and noise. Noise however is usually unwanted and excessive. Sounds are often described in terms of their characteristics; restful, loud, exciting, disturbing. These descriptions refer more to the source of the sound than the sound it self. It refers, also, to the person receiving it.

Sounds have certain properties that can be measured. Intensity is one way to measure sound - the amount of sound reaching the eardrum. This is measured in DECIBLES. Noise over 80 decibels can cause hearing loss. Below 50 is hardly ever called noise but pitch may change this for some people. Pitch is how "high" or "low" the sound seems to be. High pitched notes are usually more annoying than low pitched ones.

Irregular sounds are considered more noisy than steady ones. An air compressor that gets loud while being used and then changes pitch when it idles is very annoying.

The three characteristics (loudness, pitch, irregularity) that can make sounds most annoying are also the characteristics that attract our attention when someone speaks. We pay closer attention to louder sounds, or high pitched sounds. These sounds will soon loose their newness when we get too much of them. Most teachers find that someone "new" coming in to talk to the children will hold their attention better than the teacher for a short period of time. At the same time if the students get used to a teacher raising her voice they will stop paying any attention.

Noise is becoming more of a problem every year and new methods must be found to control some of it. It can never be completely eliminated. Many important and necessary activities produce noise. In fact if there were no noise this could become harmful. The important thing is to control the noise pollution.

Solutions have already been tried on some of the problems. Quieter trucks and cars, airports away from the city, certain types of ceilings and walls, all are being tried in the hopes of cutting down on noise.

If the students, through activities, can begin to understand the effect noise has on people and the problems concerned with noise, they are more likely to help find solutions to their problems.

IN THE CLASSROOM

CREATING SOUNDS

1. Create some sounds in the classroom. Record how many students consider each sound to be noise. Vary the pitch, loudness and duration of the sounds. If an audiometer is available, test some of the sounds that have been tried out in the classroom to find the decibels of each.

2. If the school is on a noisey street, use a tape recorder and try to find out at what hour of the day the noise level is the highest. Tape some sounds and try them on the audiometer.

3. Find a sound that is unpleasant to the entire class and tape it. Have the children take a test without any sounds other than the usual ones and then turn on the tape. Have them retake the test. See if there is a difference in their scores.

4. Experiment with different kinds of sound absorbing materials. Line some boxes with acoustical tiles, bricks, cork, glass, sheet metal, paper and any others you wish. Put on alarm clock inside and see which type of material hold in the sounds.

5. As individuals or groups design and build a diorama showing steps that can be taken to cut down on noise. (Trees, shrubs, open parks, malls, etc.)

6. Get the music consultant to bring some instruments into the class and demonstrate pitch. Let the students see how the pitch is different on the different instruments.

7. For better students a debate might be arranged on the SST-Research and the presentation could be for the PTA.

8. Check to see if local building codes have standards for sound control.

9. Have the students take the tape recorder to different areas in the school. Check the results with the audiometer. Discuss the results as to whether the loudest area was pleasant where was the best place to study, etc.

OUTSIDE THE CLASSROOM

1. Take a field trip to a noisy spot in the community. Have them suggest changes which might make the area into a more "quiet" area.

2. Stand at the intersection of a busy street. Have the children list all of the noises they hear. See which ones are necessary and which could be toned down. Keep a record of which noises seem to have the loudest or highest in pitch.

3. Make a survey of all the sounds around the school - inside and out. Let the children ask their parents if they consider any of the listed sounds noise. See if this list is the same as with the students.

4. Outside try seeing what type of sound carries the best. Try drum, whistle, hitting a glass, and others. This can lead to a discussion of communications.

5. Try some experiments in groups to see if the students can identify situations where noise has affected their own behavior or feelings. Spring them on the group at odd times to get reactions. Discuss the different reactions to the same sound. Some might be a baby crying, dishes falling, sudden noise, stack of cans, crash of a car, etc.

Below are some possible experiments and questions for the students:

A. Without moving any part of your body make a sound. Can you do it? Now try it with moving some part of your body? Which outside? Can other people hear all the sounds you listed?

Take a piece of paper. In one minute see how many different sounds you can make using your body - snap your fingers, clap hands, cough, talk. Which sounds happen inside the body? Which outside? Can other people hear all the sounds you listed?

B. Take a rubber band. In one minute see how many different sounds you can make with it and your body. Can you vary pitch?

C. Now use only you throat, tongue, mouth and lips to make sounds. List all the things you did to make a sound. Compare these to the other lists and group the different ways. Compare these with other students. Which would you consider pleasant? Which just noise? How do these affect you, as a student in a classroom?

NOISE POLLUTION

1. Kinds of sounds

   1. Take the class to several different "listening" places. Have them describe the sound they heard. Make a comparison of sounds which are pleasant and which are unpleasant (noise). What causes the sounds? Can anything be done to correct the noise (polluted sounds)? Why are the sounds pleasant and unpleasant? What can be done at home to take care of the noise? Where do they think it is best to run and shout? To play table games, etc.?

   2. Work with the children and make a list of sounds, ranking them as to which are pleasant and unpleasant. What makes these noises? What can be done to make them pleasant?

   3. Assign children (with help of a parent) to make a list of sounds heard at home and bring the list to school. What made these sounds? Which are pleasant and unpleasant?

   4. Have the children draw or cut out pictures that suggest pleasant and unpleasant sounds to them. Evaluate their learning of the idea by ranking them in order from pleasantness to unpleasantness. (Or just which are and which are not noise).

NOISE POLLUTION 5-6 grades

1. Kinds of Sounds - Listen to tape recordings of various sounds which can be collected from every conceivable location. Have students try to identify these sounds and evaluate. Which sounds do the students consider noise? Why? What changes can be made in the noises to make the resulting sounds tolerable? Pleasant?

2. What range of sound qualities are pleasant? Tolerable? Intolerable? What makes them pleasant, tolerable or intolerable?

Land Use

Land use and waste pollution go hand in hand but the idea of land use goes beyond tha of pollution problems. It strikes at the everyday increase in building, in taking up farm and wilderness land for other purposes and the sprawl and blight of the urban communities. Some discussion and ideas were included in Section III under Vacant Lot Studies but this section of the handbook will include suggestions for conservation projects as well as questions and discussions on the role of land in the environmental pollution cycle. It is important that the students understand that one type of environmental pollution invariably leads to another.

About three fourths of all the people in our country now live in urban areas. Each urban area must provide the people living there with stores providing many services and goods. There must be places for entertainment and cultural areas. There must be jobs for the people and industry to furnish materials and supplies.

Along with the many benefits of living in an urban area there are also many problems. Land becomes very valuable and therefore there is a shortage of parks and open spaces.

One of the most difficult problems is the fact that most urban areas have grown without much thought about how it should be built. Unplanned development can cost more for the people living there and the people can also experience many inconveniences and hazards. This is often called urban sprawl. Traffic congestion, old buildings not repaired and all of the resulting pollution problems are merely part of this problem. As the city grows the land pollution causes include erosion, indiscriminate clearing, removal, filing in, mining, drilling and paving of land. The effects of this can be seen in unsightliness, loss of valuable top soil for food production, the destruction of wildlife habitats in field, forest and marsh, the extinction or near extinction of hundreds of species and in the city, a growing concern for better planning for all living things.

Many areas today are in Urban Renewal areas. If the school is located in such an area a valuable lesson for the children would be to study the pro and con issues of such projects. Too often our students live in areas that have many problems but they are not aware of what can be done or what they and their families can do to change many of the problems.

Classroom Activities:

A. Obtain a community Land Use map. Discuss the purpose of zoning. Ask a member of the zoning board to speak to the class and explain to them why and how zoning laws are changed.

B. Discuss and list all of the services that would be useful in a neighborhood. Discuss how important the car might become if these services were far away from an individual's home.

Questions:

Many cities have museums, theatres and other cultural centers. What advantage would they serve for people? (Recreation)

How is money obtained to build and maintain such places? (Taxes, grants, admission charge)

Is it fair for all people to pay taxes for this type of recreation? What other recreation might appeal to other people that are built or maintained this way? (Racetracks, Amusement parks, Community parks)

How would the city benefit, money wise? (Tourists)

There are several kinds of living places in a city. Apartments and private houses are two types.

What are the advantages of each? (Apartment - no worry about yards, more people around, usually more convenient,) - Small house (more privacy, more room to play, less noise)

Which type is considered better for cities? (Apartments take up less room, live near jobs, newer)

What happens as parts of the city grow old? (Crowded, dirty, waste in the streets, crime increases)

What happens to a city that grows old? (people try to move out, industry moves away, empty buildings).

What does Urban Renewal try to do? (Replace unsafe structures with new buildings, repair better structures, clean up area.

What are some of the problems in this? (no place for people living there to go, no services left in area, unused land that may become a hazard.)

Outside Activities:

C. Make a survey of the school community. See how many types of services are within walking distance of the school. Find vacant lots nearby. Check the "zones" of the area around the school. Is the property being taken care of? Is there open land. If so what use might it be put to in the future? See Vest Pocket Parks-- Section III -- If the community needs services what would be the most needed one? Make a list back in the classroom.

D. See how natural land and water features have influenced the growth of the city. See what has happened in the school community that has affected it. What man made things have changed the community ? (Highways, bridges etc.)

E. Make a survey of the traffic on the street nearest the school. What types of vehicles use that street. Are they a hazard to the school and community? How?

F. Take an "Erosion walk" around the school neighborhood. Watch for bare soil, exposed tree roots, gullies, holes, etc. Try to find out what might have caused the erosion. What can be done about them? If they are not fixed what might happen in the future?

G. If there are erosion areas on the school site a conservation project can be done by the students--- Some suggestions are included on sheets at end of section.

After the trip outside there are many questions to be discussed in the classroom. What things did you discover that you didn't know were in the community? Where were the traffic signals? Were there other places they were needed? What services for children were there in the community? For adults? What services were needed that were not there? Which should be put in first? Were there enough parks and play areas? If not where could some be placed? Were there places to get food? Clothes? Hardware? Gas? If not where was the nearest place? If there were no nearby stores and someone did not have a car how would he get these needed items? Are there factories in the neighborhood? Is it creating a hazard for the people living there? Smell _____ Smoke_____ Other dangers. Are the houses old or new? Are there any apts?___From this the children can make a land use survey and a future plan for land use.

Urban Archeology:

In many areas in the city houses have been torn down. Usually most of the debris has been removed but some will always remain. The foundations of a house or garage, parts of the house, left over junk and plantings will often remain on the lot. This can become a study for Urban Archeology.

Below are some questions that can be used to stimulate this activity:

1. Why do you think the house was torn down? (This can lead to a discussion of Urban Renewal if that was the reason, of sub standard houses, etc.)
2. Where do you think the house stood? (find remains of the foundation if possible)
3. How many rooms were in the house? (check size of foundations. Have the children measure at home for their room size. Check rest of houses in area to see if any are two story)
4. Where was the front door? (This can often be established by a row of flowers along the front walk)
5. What did the house look like on the outside? (Look for parts of house, roof, cement blocks, painted blocks, tile, etc.)
6. How many people were in the family? (The answer to this will depend on what is found on the lot- toys, baby food jars, tools, etc.)
7. What kind of people do you think this family was? (This will be pure fantasy based on what is found.)
8. How much do you think this house and lot were worth? (This can be checked with whatever agency took the house down)

Each thing found on the site should be cataloged and tagged. A small map can be made of the site and each item entered on the map. From these items the children can build up a story about the family. What the father did, how long they might have lived in the house, etc. A shell found on the lot might suggest either a visit to a beach or a visitor who might live in Florida. All of the work can be related to present day archeology to show the children how things are learned about civilizations. After the children have reconstructed the house (draw pictures) and family, the people in the area can be questioned as to the real answers and these compared with the children's ideas.

LAND USE

As cities grow larger and larger and there is very little land left for pleasure, care must be taken to try to keep "green island" within the city. Hopefully new school sites will be chosen with this in mind, but where schools are already built such "islands" must be found and utilized. There are several possibilities for their uses. The following suggestions are but a few. The important thing is to follow up on the activities. Children should learn to take an interest in their community, and they can often influence their parents into action, the kind of action needed to fight the war on urban ills and pollution. Green growth is Earth's only producer of oxygen. For every trailer truck that diffuses carbon dioxide into the air, 100 large healthy trees are needed to convert it back to oxygen. Make a survey of recent development projects in your area. Have builders and architects made an effort to leave trees in the landscape?

A. Use the school site or adjacent as an Outdoor Lab. Make a nature trail around the edge of the school site or in an unused area. (Some ideas on how to do this are available from Outdoor Education Department) Let children lay out trail and act as guides for the school. Each grade might take the trail with a different emphasis, (ecology, animal, homes, plants and trees). Talking cards (baggage tags lettered and dipped into paraffin)can be put on trees and plants. Special types of plants could be planted (those used by the pioneers). Rocks with fossils can be placed along the trail. If a new sidewalk is put in, animal prints can be made in the wet cement and the names put underneath. Or samples of rocks and minerals of Tennessee can be put in the cement or a simple oramental wall.

Conservation:

A child who lives in the city or even on the fringes needs to be alerted to the importance of the preservation of areas not only at school but in his own yard. Soil erosion will mean something to him if it if it affects his ball field. There are usually many areas on the school site that need some work. Some activities can be done inside the classroom to show certain concepts. Then the class can move out to try to correct the situation with projects.

Erosion:

The children might like to take a walk on a rainy day to see that plant roots and leaves help to hold soil.

1. Compare a lawn, a nearby paved area, and an area of bare earth.
2. Note that water is seeping down into the earth in the grassy areas, or, if the soil is saturated, that any water which runs off is clear.
3. Water will be running off the paved area.
4. Water running down the bare area may be brownish, colored by the soil it is carrying.

To learn about the soil on the school site, the children can engage in activities such as those listed below:

1. Watch for soil on the sidewalk and find out where it came from. Probably a gully, large or small, has formed as rain washed soil down from a bare spot above the walk.
2. Note the texture of the bare soil, examining it with a hand lens. On some hillsides all of the topsoil has washed off and nothing remains but subsoil (grains of mineral with no humus).
3. Watch for piles of black humus or places where this humus has been spread on the soil.

Humus is added to the bare places where topsoil was lost, so that plants can grow again.

4. Look for tufts of grass on small hillocks of soil that stand above the level of the bare earth around them. These show how fibrous roots of plants hold soil and how their leaves help to protect soil from the force of raindrops.
5. Observe trees and shrubs whose feeding roots are being exposed as the soil washes down a slope. If too much root area is exposed, the plant will die. You may see trees that are leaning over or have fallen because their roots no longer anchor them.
6. Look for anthills. If you note the color and texture of the grains of soil the ants have carried to the surface, you will know something about the subsoil there.
7. Examine leaves piled up by the wind at the base of a hedge or a fence. If they have been there any length of time, the bottom ones will be disintegrating. Have the children remove the dry leaves on top, until those that have been pressed against the damp soil are exposed. See if these leaves are decomposing, turning into humus. Sometimes earthworms can be found feeding on leaves at the bottom of the pile. Earthworms are valuable because they take this humus down into the earth and because they create channels that let air and water enter the soil.
8. Examine any pieces of wood that are rotting, becoming humus. Use the hand lens to see the fungi, or the termites and other insects that are breaking down the wood. This will help the children to realize that rich earth is "alive": materials are used over and over again as plants and animals live and die; fungi and insects which break down these materials are performing an essential service by making minerals available for future growth.

CONSERVATION

Wattling:

Type of Project: building rip-rap to hold back or slow down eroding hillsides.

Implications:
a. Keeps hillside from washing or blowing away.
b. Often times it provides area for planting trees, brush, or grasses.
c. Usually last long enough for plants, etc., to get a good enough start to hold back the soil on their own.
d. Beautifies site.
e. Protects hillside trails.
f. Can prevent undermining of building foundations.
g. Allows the water to seep into soil instead of running off.
h. May prevent the rolling of rocks.

Cautions:
a. Start wattling at top of slope.
b. Use long, flexible twigs.
c. Drive stakes as deep as possible.
d. Do not put stakes too far apart.
e. Do not remove any vegetation or other natural obstacles already there.
f. Avoid wattling in areas where there is a danger to human safety, i.e., across trails and so forth.
g. Do not allow wattling to run down from lack of repair.
h. Allow wattling to remain until the soil is stable enough to support itself, i.e., when young trees, grasses and the like have established themselves.
i. Do not attempt wattling on too steep a slope.

Retaining Wall:

Type of Project: Designed to slow down erosion on hillsides. May be made either with rocks or logs. Very practical where eroding area is too steep to wattle. May be one wall or a series of small ones.

Implications: (Same as for Wattling)

Cautions:
a. Avoid soft, decomposing rocks and logs.
b. Do not start base with small rocks or logs.
c. Do not build too high and lose stability.
d. Select rocks and logs easily managed by boys and girls.
e. Watch to see that, as work proceeds, the rocks are not becoming too small preventing height planned.
f. Avoid "stacking." Rocks and logs must be fitted.
g. Be sure base is broad enough to support height planned.
h. Be sure wall has a slight slope toward hillside for added strength.

Retaining Wall (I) : ROCK

A rock retaining wall can be constructed with the minimum of tools. A simple rock retaining wall can be built without the use of cement. Large rocks are to be used at the base with the size decreasing as they near the top. Small rocks or stones can be used as wedges or plugs behind the wall. The base with the size decreasing as they near the top. Small rocks or stones can be used as wedges or plugs behind the wall. The base rocks should be sunk about four to eight inches into the soil at the base of the wall.

Retaining Wall (II) : TERRACED ROCK

Stairway-like arrangement on a hill or slope. Same type of construction as in the larger rock retaining walls. These walls are only built to a height of about three to four feet.

Retaining Wall (III) : LOG

This type of log construction can be made by setting four logs upright, two at each end, leaving a space between them where other logs can be set in horizontally to the desired height of the wall.

On this type of wall, end logs should be set with one end buried in the embankment. The retaining logs should be set alternately between these logs and the spaces between should be plugged with large rocks.

Gully Control:

Type of project: The piling of brush in deep gullies (rock also may be used dam style.)

Implications:
a. Brush piles slow down erosion.
b. Brush provides shelter for wildlife.
c. Catches soil behind each pile.
d. After gully is almost filled, trees, plants or grasses that are adaptable to the area may be planted.
e. Decomposing vegetation adds to topsoil.

f. Supplies an area for disposal of bramble.
g. Prevents the rain from making direct contact with the soil.
h. Slows water, allowing for better seepage.

Cautions:
a. Do not use materials that will combust spontaneously.
b. Do not allow it to become a "trap" to people walking in the area.
c. Sharp objects should not point upward.
d. Do not use good material for fill-in that can be better used elsewhere for other projects.

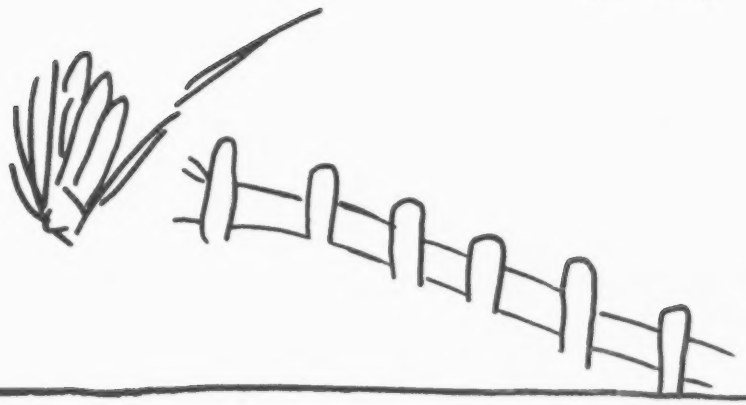
Gully Control (I)

Start at the top of the gully and fill with brush or rock. Gully may also be filled with soil and planted.

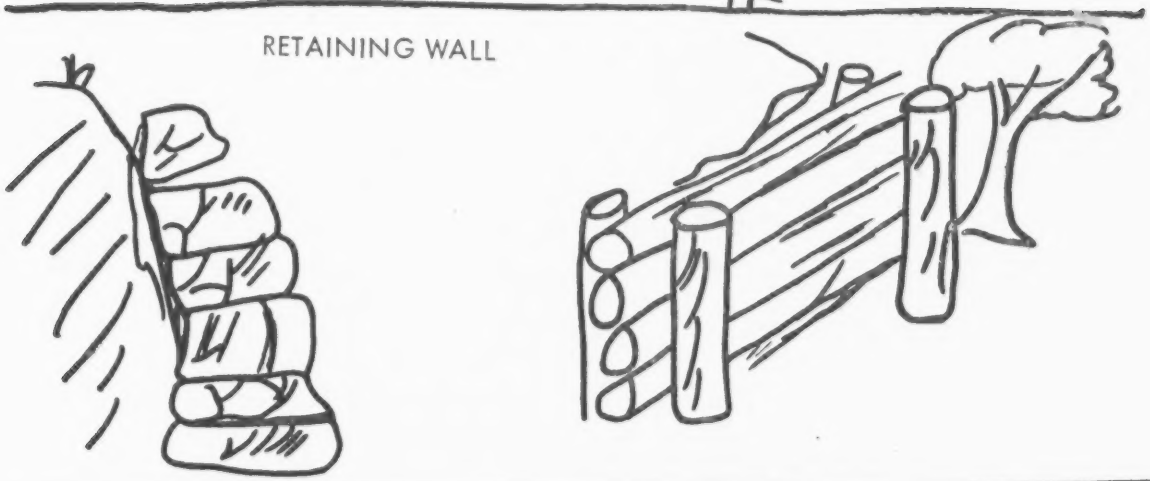
Gully Control (II)

Where gullies are large, where slope of land is ideal, and where a large amount of water passes each year, a water pond of this type may serve for fishing, as a watering pond for wildlife or livestock, and/or the surrounding area may be planted to provide shelter and furnish food for wildlife.

WATTLING



RETAINING WALL



GULLY CONTROL

Visual Pollution:

Pollution is a word that can mean many things. It should mean that something is not fit for a particular purpose. Visual pollution would therefore mean that there is not scenic beauty or visual pleasure. Most people accept things as they are; they may think some are pretty and some are ugly, and not all people agree on the meaning of these terms. We usually notice things in our surroundings of past experience or present interest. If we are driving and are hungry we notice restaurant signs, if we like horses we will notice horses as we drive.

The concern today is over the amount of visual pollution that should be allowed. Some feel that no signs should be placed along highways but others enjoy reading them. Without the signs the busiress would not be able to attract customers. Some suggestions have included certain areas with signs instead of spreading them along the highways. Some government agencies have an agreement with land owners not to erect signs on their property. This is an easement.

It is not only signs that are visual pollution but lines and poles. More and more areas are putting electric and telephone lines underground. At one time this was too costly but today, in most areas, the cost is about the same. There are some areas where this could not be done but where it could be this would greatly help the looks of any area.

Junkyards and dumps have long been an eyesore. Too often the first thing out-of-towners see as they enter a city are large car junkyards. In many areas the junkyard must be fenced and something used to screen off the sight. This, of course does not help the land pollution that is occuring with the junkyards and dumps but it does help the view.

Strip mines and quarries are very evident in some parts of the county. Today very strict lawas are being passed that will help this situation. In the past many mining companies merely left the exposed land. Today they are being requirred to replant the land with trees and grass. This, in time, will help erase this problem. New highways are being built all the time and they, too, expose the bare ground. A highway is not considered finished now unless the sides have been planted, not only for beauty bu for the erosion problem.

Old buildings are another eyesore, particularly in the urban areas. Many people cannot afford to paint their houses or keep the yards in good condition. Certain parts of towns, soon overcrowded, become visual pollution at its worst.

Some landlords do not attempt to keep up the rental property and the tenants are unable to fix them. New laws are requiring that areas be kept in better condition and often city or community fix-up paint-up campaigns can help spur residents to take care of the area.

The visual pollution problem is not an easy one. To interests are involved in it. People are beginning to want beauty, to want better looking and better styled signs put in fewer places. It will take everybody working together deciding that the environment must be pleasing to look at as well as a pleasing place in which to live if this problem is to be solved.

1. Have the students survey signs and advertisements in their own community. Have them list how many they see, where they are located and whether or not they are pleasing. Show pictures of different things to the students and have them rate if they are pleasing, slightly pleasing or not pleasing. Discuss the different opinions.
2. Take several billboard signs that are erected in the community and ask the students if, just by seeing the billboard, they would buy that product or service. Discuss the answers. Relate this to TV commercials in the same manner.
3. Take a walk around the school building. Have the students list things on and around the building that are pleasing to them-- that are unpleasing. See if the lists differ for different students.

4. Show pictures of different styles of houses. Ask what they like or dislike about each style.
5. Have as many children as possible who have a camera to take pictures of things that are pleasing-unpleasing. Put them up and discuss them. Be sure to stress that some man-made things can be very pleasing while some natural things are not pleasing. Discuss this in relation to people's background, etc. One example might be that a snake's movement and color can be very pleasing to some people while others cannot see this because they dislike snakes.
6. Check the costs of putting lines under ground in the city. Would the students want the lines put underground? Ask them to get an opinion from their parents. Where would you not want lines above the ground? If it costs more to put them underground would it be worth the cost?
7. Ask the students to conduct a survey when they are out driving with their parents. Try to count how many signs different services or goods have. Does this have any effect on how you might feel about that service or goods? Would you be more likely to stop at a place that had many signs or would it irritate you so you would not ever stop there? Discuss the effect on business if the signs were removed. Do they serve a purpose? How can they be controlled and still serve a purpose?
8. If there is an area that is very bad about too manysigns in the community you might suggest that the students drive there with their parents to see this example of visual pollution and get their reactions and the reactions of the parents. Watch for letters to the Editor in the paper which often bring up this problem.
9. If certain signs are unpleasing to most of the class you might write a letter to the company and tell them how you feel about the signs and what you might suggest as a change.

Population Problems

This may be a difficult subject to handle with elementary school students but since it is at the root of most of our environmental problems today it should be included in any study of environmental problems.

The problem can be explored from simple facts- relating the problem to the everyday activities of the children. The important thing to stress is that in a sense, our earth is a space ship. The 3 1/2 billion people now alive are its passengers. The spaceship Earth cannot grow in size. There is a limited amount of air for all of us to breathe. If we spoil our air there is no way to get more. If we spoil our water there is no way to get more. And like astronauts in a space capsule we have only a fixed amount of room. We have just so much land to raise our crops and animals for food. The problem is the "crew" of our spaceship is getting larger. It is growing so fast that we are beginning to get crowded.

Our human population is growing because more people are born than die each year. People are also living longer than ever before. Even today people are starving to death every day. Even in rich countries there are many people who do not get enough of the right kind of food to eat. Water is becoming in short supply. In many places it is already rationed. In our own country in the summer in some cities people can only water their lawn at certain times. As you are reading this, two people are being born every second.

On Earth there are two types of countries. The population of rich countries grows more slowly than that of poor countries. New medical discoveries were first applied in the rich countries and this helped the population to grow faster. In Europe and the U.S. women are having fewer babies. This holds the population down and allows more goods and services for the population.

In poorer countries the population is growing so fast that the countries cannot provide food, houses, jobs or schools. They must spend so much to make sure the people have food that they cannot buy new machines to help the farmers grow more crops. Most of the farmers are still plowing by hand and gathering the crops by hand. There is not enough food to go around and many people are too hungry to be able to work well. This, too, cuts down on the food supply.

In order to solve this problem before it becomes a question for survival we must keep our population under control. We must save the natural resources and learn to use them wisely. We can no longer afford to turn our backs on other countries and other peoples. They, like ourselves, are but passengers in this spaceship called EARTH.

Activities:

A. Move about half the chairs and books out of the classroom. Use only part of the room. Conduct several classes. Discuss with the children the effect the crowding has on their trying to learn.
B. With their parent's permission ask the children to not eat breakfast and have just a cup of water and a slice of bread for lunch. Discuss if their being hungry affect their ability tothink and learn. Relate this to people in other countries.
C. Form committees and have each group look up a medical discovery in their lifetime that has help prolong lives (Polio, heart, smallpox, etc.)
D. Find out how many children are in each family as compared with number of children in their parent's families and grandparents. Discuss this in relation to number born and died. The fact is that most pioneer families had lots of children because so many died and they needed them to help on the farm.
E. Using the room as an example figure up how many children would be in the room if each had two children and their children each had two.

SECTION IV

Special Problems

In some communities there are special problems dealing with the environment. The following are only a few of possible problems. In order to make the children aware of these problems, they should take a long look at their community. They may bring up problems that are not noticeable to the teacher, who doesn't live in that community. Once the children become aware of the meaning of pollution, of litter, and of health problems, they are more likely to be able to find examples in their community. These should be discussed and possible solutions brought out. This is where the real learning takes place. Some possible problems---

A. Rats:

In the inner city and even in the suburbs there is always the danger of rats. It is important to work on this problem through the home and community because it takes a combined effort to get rid of this pest.

Questions:

Why are there so many rats in the city?
(When the city was built the shelter for the rat predators was destroyed. Such animals as fox, snake, owl, and hawk disappeared from the area. This allowed the rat to multiply. The city rat is an imported rat coming to the country by way of ships. He adapted very well to the city.)
What do rats need to live and breed?
(Rats, like all animals, need food, water, and shelter.)
Why are rats so bad?
(Dirty, spread disease. Discuss some of the diseases. Bugs on them bad also)
How do we get rid of rats?
(By taking away their food and shelter, using poison to take the place of the predators - food in garbage - shelter in junk)

Activities:

How can children help?

1. Survey the community; to see if there are spots where rats could find food and shelter. Organize a Rat Patrol. Material is available from the Health Department that can be given to people in community.

2. Make sets of canisters (coffee and other cans with tops), covered with wall paper or contact paper to be used in each student's home - to house food usually left in a bag, food that rats like.

3. Have each child survey their home for any holes, etc. Rat holes can be stopped up by nailing tin over them. The metal can be obtained from the cafeteria - tops from # 10 cans.

Beside spreading disease, why are rats so destructive?

(Rats are Rodents. The front teeth of rodents continue to grow. The rat must keep gnawing in order to keep the teeth ground down. If this is not done the teeth could grow through the lower jar and kill the rat. He will knaw all of the time, not just to make a shelter or find food.)

Why are we getting more rats in our house if we don't leave food out?

(In some areas houses are being torn down. The rats that used these older houses for shelter are seeking another place to live and will go to the nearest house. Some trouble has been noted where houses have garbage desposals. The garbage put down the desposal attracted rats through the sewer and they investigated. Since they could not come up through the sink they got into the house through the commode. The Health Department is trying to find something that can be put into the desposal with the garbage so it will not attract rats. The problem could happen to anyone.)

4. The easiest way to take away food from rats is to put the garbage in cans with a lid. Problems, however, will often come up in regard to garbage cans. Some of the suggested activities to do with certain problems are as follows:

    a. My can gets stolen -- The Rat Patrol can stencil a person's name on the can. This will cut down somewhat on the stealing.
    b. The lid to my can gets banged up and lost -- Many neighborhood stores, at the suggestion of the Health Department, are stocking garbage can lids to be sold separately. If a store in your community does not do this, one should be approached about it.
    c. Dogs knock my cans over -- The children can show the residents of theneighborhood a simple wire (from coat hanger) holder that keeps the lid on. In some areas, the Housing Athority will bring scrap lumber to the schools or residence. This can easily be made into racks for garbage cans. This would be a good project for 6th grade boys or high school industrial art shops.
    d. The garbage collectors bang up my can -- The reason for this seems to be that many people throw their garbage into the can without putting it into bags. It sticks to the bottom of the can and the collectors bang the can on the truck to break loose that garbage stuck on the bottom. If all garbage was put into paper bags, this would not be necessary.
    e. Trash and old cars, etc. in vacant lots and alleys are good shelters for rats. The Health Department, with the money from the Government as well as City Beautiful, will collect junk. They will not pick up pieces along th sides of streets, in alleys or lots. This litter and junk could be collected into a pile by the children; use rakes or big plastic bags; then it can be collected by the trucks.
    f. Will just killing the rats do the job? -- The area must also be sprayed to get rid of the lice and fleas that were on the rats. They will seek another home on a dog, cat, or human. Rats will continue to multiply unless their food and shelter is taken away from them.

The Health Department has a great deal of material that they will give the schools and they also have a film program to be shown.

The Outdoor Education Department has directions for the canister sets and a special Rat Patrol song for the children.

Posters and programs can be used to help educate the children and parents about rat control.

References: Metropolitan Health Department

Book, Rats and Mice by Silverstein, Lothrop Publishing Company

B. Odors From Factories, etc.

In some areas there are factories that burn or release odors. This is not only air pollution but very disagreeable to all who live nearby. If such a problem exists, it is well to, not only discuss it with the children, but bring it to the attention of the authorities and alert the community to the possible ways to

combat it.

1. What is causing the odor? Find out what is being made at the factory - rendering feed, chemicals, etc.
2. Why is it bad? (Aside from the unpleasantness of the odor, the particles in the air could be harmful, not only to people, but to birds and other animals.)
3. What could be done about it? (This could take some research but there are methods that can be used to re-cycle the smoke or a different method to get the job done.)
4. Is it against the law? (All pollution over a certain amount is not against the law. The Health Department has a list of such laws and how much is allowed)
5. How else is this factory polluting the area? Check for pipes allowing waste to go into water, open areas, etc.

All this works in well with the Air Pollution Unit. A survey could be made as to how many days in two weeks that the wind blows the odor and/or smoke towards the school.

C. Vacant Houses - Junk

In many areas houses are being torn down for highways, new houses, or other projects. Too often most of the junk is left for a period of time without being removed. This is a form of pollution, and the problem should be discussed.

1. Where is the torn down house and/or junk going? What happens to it? (Usually the companies that bid on the demolition will resell the building material. The junk that cannot be reused is usually burned (more air pollution).
2. Why do they take so long? (The companies are many times small businesses and do not have a lot of man power.)
3. What could be done with the area that is left? (A bulldozer could smooth over the lot and something could be grown there until it is finally used for a house or building. Donated flowers or grass seed could be planted on these by the children.
4. How else are such areas an environmental problem? (Rats that have lived in the building will seek shelter elsewhere. Parts of building left standing will become a hazard; glass, nails, etc. will be left behind. This would be a good discussion on safety; stay away from the area.

These areas should be considered in the Land Use Unit for possible playgrounds or outdoor laboratories.

D. Hazards - No Sidewalks, Traffic Problems, Dumps

In many areas there are hazards that affect the children walking to school. This is particularly true in the suburbs where there are no sidewalks. This is an environmental problem and should be discussed by the children. Other neighborhood problems might include dumps nearby, undersirable people living near the school, and heavy traffic problems.

1. If there are no sidewalks near the school, the following things can be done:

   Where are children walking? If on edge or shoulder, is it wide enough? Do they fully understand the safety rules for walking on a road or highway and why? Make a car survey early in the morning and after school to determine about how many cars and trucks pass the school at the time the children are walking to school. Discuss who's responsibility would it be to put in sidewalks? (This is a debate now between schools and local government) How far would it have to extend to be safe? (Measure the proposed area) Would the sidewalk help the entire community? How many children in the school have to walk down the highway or road? What are

their ages? Have any been hurt? What has held down the possible accidents? (Training and the patrol mothers and members) How could a community get a sidewalk? (By working through the councilman, letters to authorities, and making the problem known.)

2. Dumps

Often a fill or dump is put near a school or in the community. As a problem, this can be used for discussion and possible action.

Why is the dump necessary? (Trash must be put somewhere) Why is it bad for the community? (Eyesore, possible source for rats; if burned, air pollution; If children play around it, they could be cut or injured) If the dump was not there, would that be a hardship to anyone? (The disposal of waste is a great problem. Some areas do not have a pick up service and have no place other than a dump to bring their trash and garbage. Too many people, instead of taking the trash to a dump will drop it along the road, creating a hazard and a pollution problem. New ways MUST be found to dispose of trash.) What is the difference in a dump and a land fill? (A land fill usually has only trash, rocks, dirt, no garbage. Soil will be used to cover the area as soon as the depression has been filled. The land can then be used and much of the trash will go back to soil. A landfill is ONE method of using trash that can be good.) What can be done to have a dump removed? (It would have to be proved that it was a hazard to the community and since it might be necessary a new dumping place not so close to people living would have to be found.

There are many other possible environmental problems in a community that can be used for discussion and possible solutions. The children MUST get involved if the learnings are to be complete. Talk is not enough. There must also be action.

BIBLIOGRAPHY
FOR ENVIRONMENTAL PROBLEMS

AIR POLLUTION

Air and Water Pollution, Leinwand, Gerald and Poplin, Gerald, Washington Square Press.

Let's Go To Stop Air Pollution, Chester, Michael, G. P. Putnam Sons

Dirty Air, Environmental Science Center, Golden Valley, Minn.

Troublesome Tail Pipes, Environmental Science Center, Golden Valley, Minn.

Clean Air, Sparkling Water, Shuttlesworth, Dorothey, Doubleday and Company

The Air We Live In, Marshall, James, Coward-McCann Company

Our Polluted World, Perry, John, Franklin Watts, Inc.

Clean Air, Lewis, Alfred, McGraw Hill

WATER POLLUTION

Water Fit To Use, Carson, Carl, John Day Company

Pesticides Are Perilous, Environmental Science Center, Golden Valley, Minn.

Tragedy In the Laundromat, Environmental Science Center, Golden Valley, Minn.

Lets Go To Stop Water Pollution, Chester, Michael, G. P. Putman and Sons

Exploring Water, Fellger, Benefic Press

Water, The Wast of Plenty, Raffo, John, Environmental Education Center, Sother, N.J.

The Air About Us and Fresh Water, Chandler, T. J. Doubleday

The First Book of Conservation, Smith, F. C., Franklin Watts

LAND USE

How Do They Get Rid Of It?, Hilton, Suzanne, Westminster Press

Trash Is Taking Over, Environmental Science Center, Golden Valley, Minn.

For Pollution Fighters Only, Hyde, Margaret, McGraw-Hill

The Only Earth We Have, Pingle, Laurence, McMillian

The Little About Lots, Park Ass't of New York City

The Living Earth, Farb, Peter, Harper and Row

About The Land, The Rain, and Us, Shannon, Terry, Chicago Children Press

What Is Soil?, Syrocki, B. John, Benefic Press

Planning Our Town, Munzer, Martha, Knopf

A Handful of Soil, Simon, Seymor, Hawthorne

A Place To Live, Bedenict, Jeanne, Parents Magazine Press

NOISE POLLUTION

Sounds and Silence, Environmental Science Center, Golden Valley, Minn.

Noise Pollution, O'Donnell, Patrick A., Addison-Wesley Publications

Our Noisy World, Navarra, John, Doubleday and Son

POPULATION

This Crowded World, Frankel, Lillian, Columbia Publications

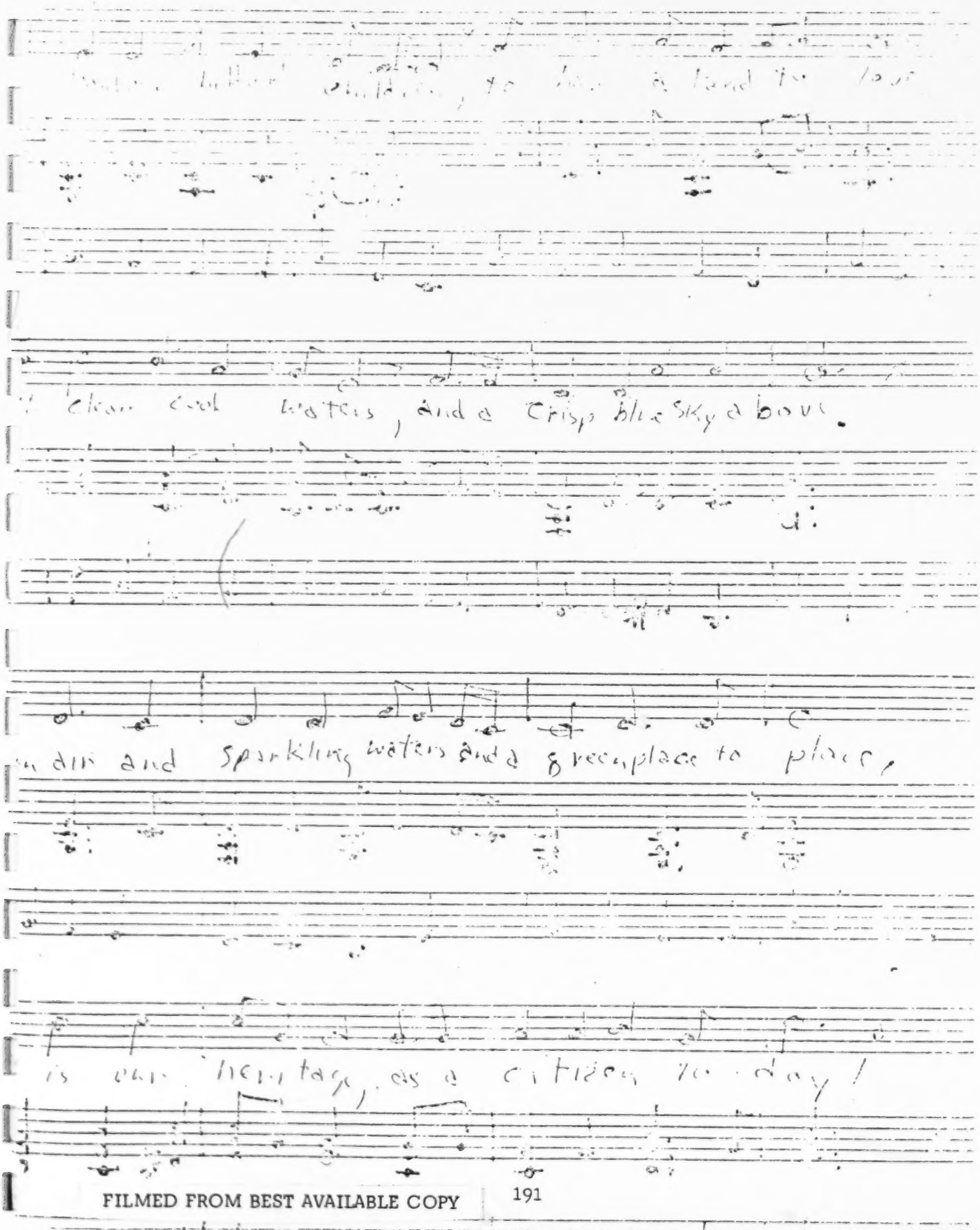
VISUAL POLLUTION

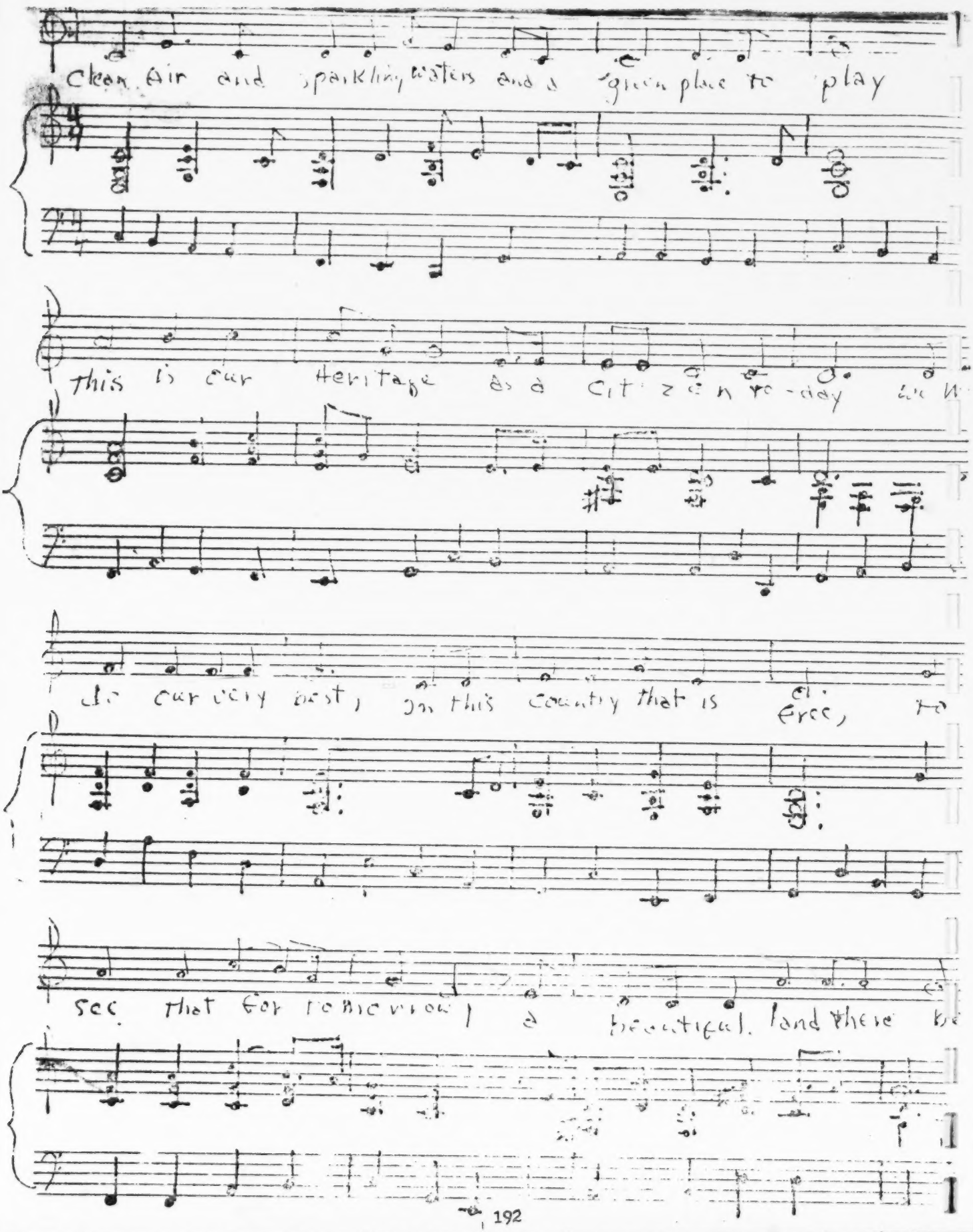
Eco-Problem Posters, Knapp, Clifford, Instructor Publications

Urban Living, Milton Bradley Posters

OTHER REFERENCES

Films

If You Live In A City, Where Do You Live, Series of 5 Films, National Inst. Television

clean cool waters, and a crisp blue sky above.
in air and sparkling waters and a fireplace to place,
is our heritage, as a citizen today!

FILMED FROM BEST AVAILABLE COPY

Clean air and sparkling waters and a green place to play
This is our heritage as a citizen to-day we
do our very best, on this country that is free,
See that for tomorrow a beautiful land there